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VOLUME 13, No. 1 JANUARY 1961

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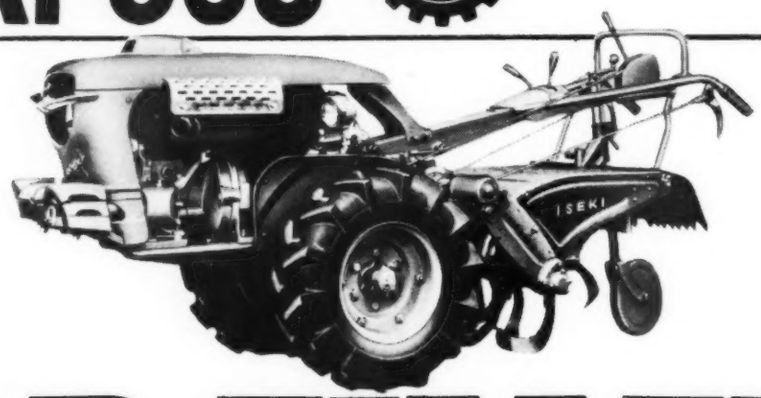

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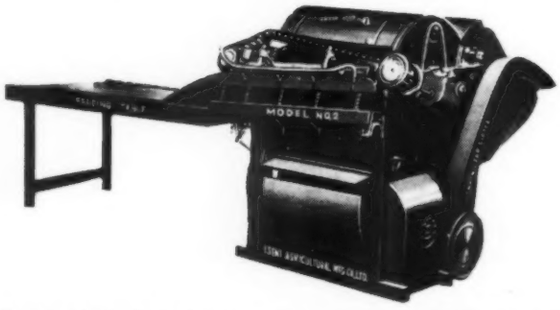

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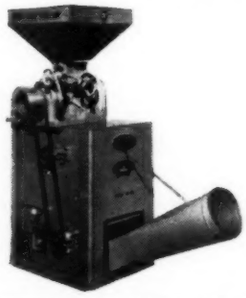

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Editorial Comment

Better Seed, Better Crops

'THERE ARE very good reasons to think that if all farmers, foresters and horticulturists were using first-quality seed, world crops could be increased by 25% and, in most of the under-developed countries this increase would reach 50%', according to Mr. J. J. de Jong, of FAO.

Actual examples can be quoted. Thus in Yugoslavia a team of four FAO experts introduced in 1957 some high-yielding wheat varieties from Italy, with the result that between 1955 and 1959 the overall yields rose from 1,100 kg. per ha. to 1,700 kg. per ha., and the country is now self-supporting in wheat, whereas at one time it had to import a million tons annually.

Another remarkable example comes from the United Arab Republic, where through the introduction of improved varieties of wheat, the average yield per ha. rose from 3.67 tons to 5.51 tons—an increase of 53%. This, together with an increase in the planted acreage and the use of fertilisers, has raised production from 652,000 tons to 1,790,000 tons, so making the country one of the leading rice exporters.

Similar results have been obtained by FAO with the introduction of improved varieties of cotton coupled with improved methods in certain Central American countries. In less than three years yields per acre were increased from 600 lb. to 820 lb. in El Salvador, from 400 lb. to 560 lb. in Guatemala and from 410 lb. to 550 lb. in Nicaragua. The total production of cotton in five countries rose from 300,000 bales to 550,000 bales.

Extraordinary results, too, have been achieved in the Congo through the artificial hybridisation of the oil palm. The resulting hybrids are yielding after seven years between 2.5 and 4 tons per ha.—an amazing result since other oil-bearing plants, such as the coconut yield only about a ton of oil per ha.

A final example is the introduction of a new outstanding variety of coffee into Brazil after the disaster of 1955. Some 80% of the total area was replanted and the result was an increase in yield from 500 kg. of clean coffee per ha. to between 1,000 and 4,500 kg. per ha., according to conditions.

All this adds up to the obvious conclusion that 'better seed means better crops'.

International Seed Year

How to provide enough food for a constantly expanding world population—already about 3 thousand million people and growing at the rate of 100 every minute—is, we consider, the most urgent problem of our time. One of the simplest and most effective ways of both increasing and improving food production is through the adoption of seed of superior varieties, *i.e.* high-yielding and disease-resistant seed.

A world-wide campaign to encourage and promote the use of better seeds has been launched by FAO, and the year now commencing has been designated as 'International Seed Year', during which seed improvement campaigns will be conducted in all member countries.

The tremendous agricultural development which has taken place in the more advanced countries during the last 50 years owes much to research into the production, multiplication and efficient distribution of clean pure seed which will produce larger crops from the same acreage, and of special cultivars suited to the prevailing conditions in each area.

The FAO World Seed Campaign now has 60 countries actively participating, each with National Seed Campaign Committees developing programmes to meet their individual needs, but many of them need material aid and financial assistance to carry their plans into good effect.

Education Essential

To be able to produce superior seed is not enough; it must be adopted and used correctly. Even in the well-advanced countries, such as Britain, there is to be a drive for the still wider adoption and use of high-quality seed. At the same time, educational courses for trainees from other countries are to be provided in Britain as a contribution to the world campaign.

This will take the form of a six-week course in seed testing and certification at the National Institute of Agricultural Botany at Cambridge. The Ministry of Agriculture of Northern Ireland and the Department of Agriculture and Fisheries for Scotland will be doing the same.

As its contribution, Australia, we learn, is offering training facilities for administrators and senior technicians in the form of a three-week course of lectures and demonstrations at Canberra, with study tours in addition. The syllabus will cover plant exploration, plant introduction, quarantine, testing of introductions, genetic adjustment, morphology and physiology (including dormancy, viability and germination), effect of seed-borne diseases and weed impurities, seed multiplication, seed dressing, seed testing, seed storage and seed certification. This course, we understand, is intended to cover the basic principles as an introduction to a more advanced course for selected students.

In view of the success achieved by the Training Course in Seed Improvement in Canada in 1959, the Government of Canada also has decided to repeat the course this year. This will cover the organisation of research, testing, grading and certification facilities, including the search for high-class seed stock, protection from seed-borne diseases, protection from insects

in storage and methods of propaganda to encourage the wider use of better seed. This covers the management of seed plots, home seed cleaning and storage, certification, sale and distribution.

Gift Coupon Scheme

At this point the individual reader may well say: Yes, but what has this to do with me? It's for the Government to do something about it. In what way can I help the World Seed Campaign? That's what FAO is for.

This is the very natural reaction of most citizens today, who feel themselves so overwhelmed by the march of events. They are aware that food problems are of vital importance to everybody; in fact, they are the real key to world peace, but individuals seem powerless to help.

The fact is some nations would rather waste their resources on atomic bombs, atomic submarines and atomic missiles than on the development of world agriculture through FAO, whose funds and manpower are totally inadequate to meet the needs of the newly self-governing nations, who through the irresponsible policy of accelerated self-government have now no proper organisation to continue to develop their agricultural resources adequately to meet the ever-increasing economic needs of their ever-growing populations.

Another of the organisations of the United Nations—UNESCO—has evolved a scheme to combat this feeling of impotence and enable people with generous thoughts—particularly those with happy recollections of the 'good old days'—to translate these feelings into practical action. This scheme has now been extended to cover FAO's World Seed Campaign, so that it will now be possible for any of our readers to make a direct contribution.

In countries where people obtain their meagre crops by age-old methods using primitive implements, the provision of simple processing equipment for preparing seed could make a revolutionary difference. A small sum, given to one country could be used to buy the simple laboratory equipment for testing seed; in another, a larger donation could buy a mobile seed-processing unit for threshing, cleaning, grading and treating the paddy seed produced by the smallholders.

How the Scheme Works

A UNESCO gift coupon is a kind of money order, ranging from £5 to much larger sums. This can be used by the beneficiary or recipient in any currency he likes for the purchase of any article of an educational, scientific or cultural nature. Usually donors specify the purpose for which their coupons are intended, and donor groups which contribute £20 or more may adopt a particular country or region in which they are particularly interested. In the case of smaller gifts, UNESCO (for reasons of economy and simplicity) selects the beneficiary, taking the donor's wishes into account as far as possible.

So far as the World Seed Campaign is concerned, the Seed Campaign Committees of the countries named will be the beneficiaries in such cases. The recipients will acknowledge directly to the donor the receipt of the gift coupons, thus establishing or renewing a friendly international relationship between donors and beneficiaries.

This system eliminates the troublesome tasks of purchasing, packing and shipping, which might complicate the gifting of such items as laboratory and technical equipment, audio-visual aids for training and instruction and agricultural chemicals and grading machines. Through the UNESCO scheme, sending a gift—whether a threshing machine, a seed-testing outfit or an instructional film—becomes as simple as sending a letter. You may obtain further details from the UNESCO Public Liaison Division, Place de Fontenoy, Paris VIIe, France.

Seed-Treating Machinery

The importance of seed-grading and seed-treating machinery to the World Seed Campaign needs to be emphasised, for the use of clean pure seed and seed which can resist soil-borne pests and diseases, through the use of seed dressings, are certain to play a big part in this campaign for higher yields.

A new type of seed cleaner introduced into Britain last year can, it is claimed, completely remove the pernicious weed, wild oats, from seed oats; similarly, it can grade and clean grass seed just as effectively. This machine will clean about 400 tons of all varieties of cereal, grass and bean seeds in a week. In California a similar machine is reported to be dealing with 15,000 tons of grain seed at a maximum rate of 7 tons per hour. Similar results are reported from New Zealand and California, according to the latest issue of the *World Seed Campaign News*.

There is now evidence that seed treatments applied as liquid dressings are more effective than the same treatment applied as dusts, for powder dressings cannot get into the minute crevices in the seed coat and they cannot, therefore, reach deep-seated fungus spores. Furthermore, powder does not adhere as well as a liquid disinfectant; if, in addition, the liquid is atomised, it can be used more effectively and economically.

By this process it is claimed that an extremely minute amount of the liquid is absorbed on to the seed coat of every seed. The advantages are therefore uniform distribution, deep penetration and effective retention. The economy in the amount of chemical that has to be used is obvious.

Courage in Adversity

ADVERTISING has been the keynote of the success of the Hawaiian pineapple industry ever since 1909, when the sum of U.S. $50,000 was spent in magazine advertising, using the slogan 'Picked Ripe—Canned Ripe' to clear surplus stocks of canned pineapple which had accumulated. There was a second campaign in the period 1913-15, when the total amount spent on advertising was U.S. $100,000. Once again an accumulation of surplus stocks was disposed of. The longest campaign ran from 1921-28, when stress was laid on new uses for canned pineapple in salads, flans, ice cream and similar sweet dishes. New recipes were included in the colourful advertising and informative editorials were published. Over this period, sales expanded from 10 million to no less than 17 million cases per year.

Another big effort was required in 1932. In 1931 the industry had packed no less than 24 million cases of canned pineapple products, then worth approximately U.S. $20 million. Unfortunately, this was the year that the world-wide economic depression finally reached Hawaii and the whole price structure broke down. Even so, the vast sum of U.S. $1,500,000 was spent on advertising in the press and on dealer education—this is the equivalent of £2 million in present values and taking inflation into account. This bold action once again effectively disposed of the enormous accumulation of packed stock.

Thereafter production backed by colourful advertising has continued on a steadily expanding scale, as the following figures, covering the period of the depression, convincingly reveal: 1903, 3,900 cases; 1909, 800,000 cases; 1915, 5.3 million cases; 1921, 10.5 million cases; 1931, 25.6 million cases. Truly, in adversity, it pays to advertise.

Deepening Depression

A SERIOUS situation is now developing in the motor industry in Britain and there is growing unemployment. The Ministry of Labour statistics for August indicated that more than 400,000 people were working in the industry. According to the labour unions, there are now about 180,000 people on short time and total unemployment is growing. Because of the large number of associated industries, other important industries will be affected and, according to a leading trade union official, the situation will get worse.

We, as farmers and manufacturers, are principally concerned with farm vehicles, light trucks and tractors and, in so far as these industries are concerned, the principal ancillary industries which will also be affected, if the situation is allowed to worsen, are oil, agricultural chemicals, paint oils, rubber, cotton, electrical accessories, castings, forgings and plastic castings etc. and also, incidentally, home and imported foods, as there would naturally have to be severe retrenchment in family budgets.

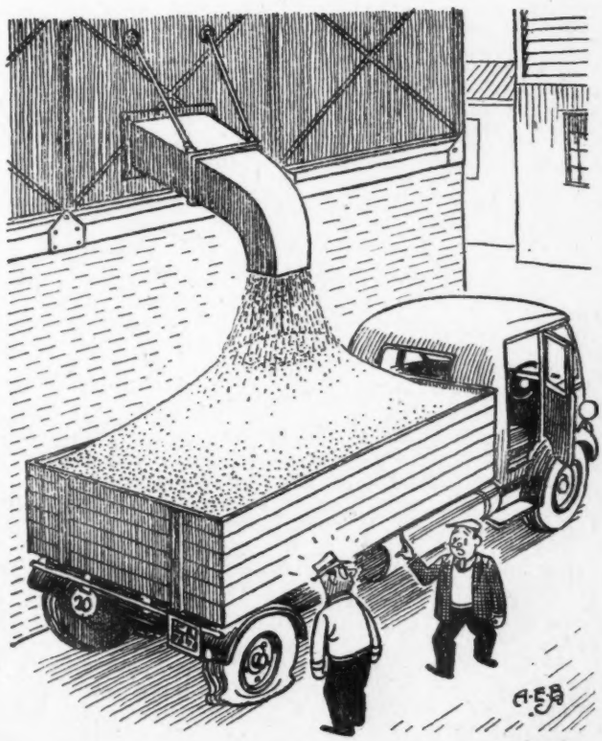
This gloomy picture of a snowballing depression can be prevented—indeed, the situation need not worsen—if overseas markets are developed in such a way that the increasing volume of trade—both ways—will be to the mutual benefit of importers and exporters, as was the original purpose of the idea to set up a European Common Market (see WORLD CROPS, 1958, 379 and 393; 1959, 2, 205, and 308; 1960, 3).

The position in the newly self-governing countries, too, could become very serious if the situation were allowed to deteriorate, as they mostly depend on continued overseas demand for the primary products which they produce. Those with long memories will remember how the 1929 depression ultimately reached the Far East in 1931 and caused widespread hardship. A similar situation was developing in 1949, but this was effectively prevented from developing into a major crisis on a global scale. Now what about the present crisis?

High Optimism

It was the British Prime Minister—not just the President of the Board of Trade, be it noted—who exhorted British industry to redouble its efforts in the export field. He appealed to British businessmen, not yet exporting, to become the 'merchant adventurers' of today.

Ford of Dagenham heeded the appeal and set



'I've just remembered, Fred—I left the spare on the floor of the lorry'

about planning an international convention in a country which with its own domestic tractor production, offers the sharpest challenge to British manufacturers.

Accordingly 1,000 guests of the company—Ministers of State, diplomats, heads of Government departments, agricultural services, universities and research establishments, Continental manufacturers and the heads of several influential trade organisations—brought from 15 countries—assembled in Hamburg, the thriving and volatile West German industrial city at the centre of the controversial European Common Market area as it at present exists.

In his opening address Sir Patrick Hennessy spoke about the complicated position between the 'Six' and the 'Seven' and predicted that Europe will ultimately emerge as a single united territory—the United States of Europe. His answer to the threatening slump was a massive one-firm export drive into the European Common Market and he called on other manufacturers to follow his example.

'Let's be audacious', he said, and his speech was followed by a spectacular and dramatic display of the enormous range of their agricultural and earth-moving tractors and cars of various h.p., and light and heavy transport vehicles, in an indoor arena with announcements broadcast in six languages.

The following day these same vehicles were seen in action in a convincing demonstration under field conditions. The new 'Dexta' and the 'Super-Major' tractors were fitted with implements of British and Continental manufacture—thus emphasising the fundamental importance of the tractor as the key to the present situation. The convention was indeed a symbol of high optimism and a determination to succeed, backed as it is by the £75 million expansion programme of a company with global interests.

Rice Sowing from the Air

HELICOPTERS MAY revolutionise the sowing of paddy in Australia's rice-growing areas, such as the Murrumbidgee Irrigation Area in New South Wales and Humpty Doo in the Northern Territory (see WORLD CROPS, 1958, **10**, 80). The Australian Rice Marketing Board has asked an Australian airline, Ansett-A.N.A., to carry out test sowing of rice from the air with helicopters.

Germinated rice will be used for the aerial sowing. This involves soaking the seed for 24-28 hours, allowing it to drain and re-drying it. It is then ready to be dropped in the already flooded rice fields.

The Bell 47J helicopter to be used will be fitted with two hoppers containing the seed. When each lot of seed falls from the hoppers the down-draught from the helicopter's rotor blades will spread the seed over an area of 35-40 ft. Three to six grains a square inch is the correct spreading ratio.

Forest Fires and Litter

PUBLIC CAMPING sites have been opened in seven of the eight national parks of Britain. This carries with it two risks: that the 'litter lout' will desecrate such beauty spots as the Forest of Dean in Wales, Glenmore in Scotland, or the New Forest in Britain; or that fires started by some careless 'tenderfoot' will destroy vast areas of valuable forest land.

Fire constitutes the gravest and most consistent threat to the well-being of Britain's woodlands. We learn from the Forestry Commission that in a recent five-year period no less than 5,614 fires were reported and 3,287 acres of trees were destroyed. Many of these fires were started by thoughtlessness and carelessness. After a long dry spell a carelessly dropped match or cigarette, or an unextinguished picnic fire, can cause enormous damage. The need for caution, therefore, cannot be too strongly stressed.

What is a Cultivar?

WE MUST confess to not having a very clear idea of what is meant by the new term 'cultivar' which has been adopted by the International Code of Nomenclature for Cultivated Plants for formal international and scientific purposes. Apparently the main intention is to abolish the use of the term 'strain'. Hitherto it has sometimes been the custom to designate an improved selection of a variety as a 'strain'. Now any such selection showing sufficient established differences from the parent variety to render it worthy of a name is to be regarded as a distinct entity, and from now on all varieties and strains are to be known as 'cultivars'.

Thus the term 'cultivar' is the formal equivalent of variety, but it goes further, for it is now to include any derived plant group with defined botanical features which are reproducible in subsequent generations. If they are not reproducible, it is not a new cultivar.

Quality not Quantity

THE LARGE grain surpluses in the U.S.A., Canada, the Argentine and Australia represent a constant threat to the price structure of world wheat markets.

The immediate problem is the lack of purchasing power by many potential consumer countries and it is only to be expected that such countries will buy their wheat requirements where they can get the best value for their money.

No less a person than the chairman of the Australian Commonwealth Banking Corporation, Mr. W. D. Donald, considers that the Australian Government and grower authorities should actively discourage the production of varieties of wheat which cereal chemists have found to have poor baking qualities, even though they may be high-yielding varieties.

Rice. Transplanting rice in Java to obtain high yields

Report on World Crops in 1960

This is a WORLD CROPS *digest of the report of the FAO Council on 'The State of Food and Agriculture, 1960', and the report shows that the increase in world agricultural production is still slightly greater than the estimated world population growth.*

PRELIMINARY estimates indicate that the increase of 5% in world agricultural production (excluding Mainland China) in 1958-59 was followed in 1959-60 by a rise of about 2%, a little more than the estimated annual population growth of 1.6%. Indications are for a larger world production of commodities in 1960-61.

The largest increases in agricultural production in 1959-60 were in Western Europe and the Far East. Other regions showed little change, except in Africa, where the output of both foods and non-foods declined, the drop in foods being sharper. Grain production in Africa was 1.3 million tons less than in 1958-59, and coffee and cocoa were almost the only products to show large increases. In the Near East grain production fell by a further 860,000 tons from the low level of 1958-59 and increases in other crops were sufficient only to offset this decline.

Although this deterioration in the Near East and Africa must give rise to some concern, there is no real shift in the centre of gravity of the world food problem. Despite recent improvements in the Far East, this region had a very small share of world agricultural production in comparison with the large proportion of the world's population concentrated there. Though the rate of population growth in the Far East was comparatively slow (1.4%), there were 11 million additional persons to feed each year (excluding Mainland China). The implications of so massive an increase in terms of additional food requirements needs no emphasis. In Mainland China another substantial rise in agricultural production was reported in 1959-60.

Per caput food production in the Far East (excluding Mainland China) now appears to have improved to within 3% of the pre-war level, compared with a deficit of 7% as recently as 1957-58. In Latin America, the Near East and Africa, however, food production *per caput* fell in 1959-60.

In 1959 exports of agricultural products increased in volume by about 6% over 1958. Average unit values of exports declined by a further 3% and the total volume of exports thus rose by only 3%. The volume of agricultural raw material exports in 1959 rose by about 10% over 1958, but their value still remains some 14% lower than 1957.

Agricultural policies

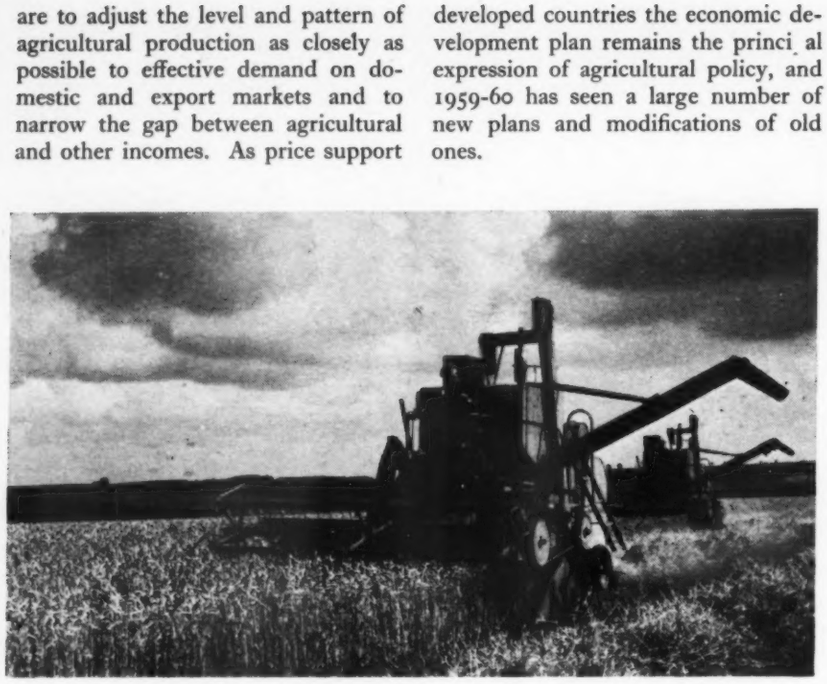
Agricultural policies continue to reflect the sharp contrast between the agricultural demand and supply situation in the industrialised countries and that of the less developed parts of the world. In less developed countries it is not easy to achieve a high rate of increase in production, but demand is rising in these countries and a large part of any increase in income is spent on food.

The principal aims of agricultural policies in the more advanced countries

are to adjust the level and pattern of agricultural production as closely as possible to effective demand on domestic and export markets and to narrow the gap between agricultural and other incomes. As price support systems have often failed to achieve these objects, there has been a tendency in Western Europe to seek improvements in farm incomes through measures to raise efficiency and improve farm structures. This has been reflected in modifications to support policies in some countries in 1959-60 as well as in the agricultural policy proposals of the Commission of the European Economic Community.

In Japan, the costly price supports for wheat and barley may be gradually replaced by assistance in raising quality and efficiency of production. In Australia and New Zealand, measures to improve efficiency are receiving still further emphasis and in Canada the guarantees for two products have been limited by the introduction of deficiency payments. In the U.S.A. attempts to reduce surpluses by restricting acreage have largely been offset by rising yields.

Most of the less developed countries are unable to afford high levels of support and their agricultural policies are aimed mainly at the protection of consumers and the avoidance of inflation. The question of incentive producer prices is receiving attention in some of these countries and a few schemes have been introduced for certain products, especially in the Far East. In the majority of the less developed countries the economic development plan remains the principal expression of agricultural policy, and 1959-60 has seen a large number of new plans and modifications of old ones.



Wheat. The new Viking wheat yielded over 50 cwt. per acre on a farm in Lincolnshire, England. Its short ramrod straw makes it resistant to lodging

Measures to improve production efficiency are also becoming an increasingly important part of policies in some of the less developed countries. Most agricultural exporting countries are paying more attention to measures for the promotion of exports and for widening their markets for agricultural products.

Modifications in the structure of the collective farms have continued in centrally-planned economies, such as the U.S.S.R., and similar changes have been undertaken in several of the Eastern European countries, where there has been a renewed spurt in the pace of collectivisation. In Mainland China there was some reorganisation of the rural commune system in August 1959.

The tendency toward regional coordination has again been a marked feature of the year under review. In Western Europe the proposals of the Commission of the European Economic Community for a common agricultural policy have been published and seven countries have established the European Free Trade Association. In Latin America seven countries have joined in a Free Trade Association and three Central American countries have set up an economic association.

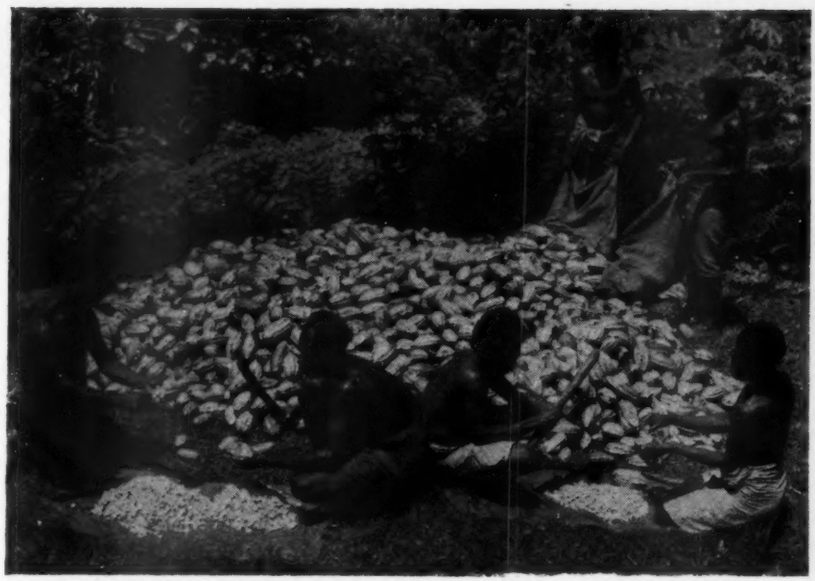
Commodity survey

Substantial increases were recorded in production of most of the main commodities, especially in maize,

Maize. Cutting the crop by means of a forage harvester with a maize attachment

cocoa, cotton, wool and rubber, but wheat production was lower. Output of dairy produce declined in the second half of 1959 and butter prices rose steeply for a time. Production of copra and coconut oil remained low and there was a sharp reduction of apples and pears after the bumper crop of 1958-59. Sugar exports were lower and prices declined considerably. Jute production also fell.

Present prospects are for larger production of most commodities in 1960-61, although coffee is likely to fall below the very high level of the previous year. Although a continued high level of demand is likely to prevail in most importing countries, prices of raw materials are unlikely to show any great increase, while those for the majority of foodstuffs and beverages will probably remain under pressure. The tendency for production of a number of commodities to increase somewhat faster than consumption may continue in the next three to five years.



Cocoa production is a new industry in Papua and New Guinea, but is already well established

Cereals

Total grain stocks in the major exporting countries now amount to the unprecedented figure of 126 million tons, or about 40% of current world production of wheat and 25% of coarse grains (excluding stocks in the U.S.S.R., Eastern Europe and Mainland China). In terms of commercial exports, stocks would cover almost two years' world wheat exports and almost four years' exports of coarse grains.

Wheat

World production in 1959-60, at 136 million tons, was above average, but about 4 million tons less than the previous year's record crop. Increases in Western Europe and Canada were insufficient to offset the 9 million tons decline in the U.S. output. Production in Australia and Argentina was lower. A heavy crop (12.8 million tons) was reported from Eastern Europe, but the U.S.S.R. failed to maintain the previous year's record high level of production.

The 1960-61 crops may be slightly higher than those of the previous year. Six million tons more wheat are expected to be harvested in the U.S.A., and Argentina farmers intend to plant a larger acreage. Crops in Western Europe and India, however, are unlikely to exceed their 1959-60 record levels.

Coarse grains

The record coarse grains crop in 1959-60 exceeded that of the previous year by about 4%. The aggregate crop was about half that of the previous year in Australia; Eastern Europe expected a larger output, but in the U.S.S.R. production decreased because of unfavourable weather and a decline in acreage.

The exceptional increase of 17 million tons in maize production was the result of the large crop in the U.S.A., where the area increased by 15% following the removal of acreage restrictions. There were also substantial gains in Mexico and Yugoslavia, but the maize crop in Argentina was about one-fifth smaller. World production of barley was slightly higher, increases in Western Europe and India offsetting reductions elsewhere. Production of oats decreased by 15% as a result of the downward trend in acreage.

In 1960-61 slightly smaller crops may be expected in Western Europe. An expansion of the Conservation Reserve Programme in the U.S.A. will take an additional 2.2-2.7 million acres out of production. Increased prices in Argentina, however, may lead to an extension of acreage in that country.

Rice

World production of paddy (excluding Mainland China, North Viet-Nam and North Korea) in the current year is estimated at 142 million tons, which is above last year's record level. Current world supplies are larger and, although demand remains generally strong, international market prices are likely to be lower. Most exporting countries have more rice available for sale than in the previous year, but there is reason to expect Mainland China's exports to be considerably less. Some increase in stocks carried over in exporting countries will probably occur, but there seems no immediate danger of a serious unbalance developing between world supplies and demand.

The long-term outlook is more obscure. On the one hand, paddy production is still greatly dependent on uncertain rains; on the other hand, world production shows a markedly upward trend, though the rate of increase has slowed down in recent years.

Plantation Crops

Cocoa

Favourable weather in most of the major producing countries in 1959-60 resulted in a crop of about a million tons, or around 150,000 tons above the average of the past five years. Other factors contributing to this increase include the marked improvement in

Sugar-cane. Burning off cane in Northern Queensland. This practice eliminates the thick undergrowth and the leaves and drives away the snakes, so making the work of the cutters much easier

control of pests and diseases and, in some areas, the coming into bearing of new plantations and improved varieties. Both Ghana and Nigeria harvested record crops of 315,000 and 150,000 tons respectively and production in Brazil is forecast at 190,000 tons, an increase of 9% over 1958-59.

Production of cocoa is rising, but as yet it is difficult to evaluate the long-term outlook. It is not clear how much of the recent increase in production is due to new planting and how much to measures taken against diseases and pests. There are considerable potentialities for further expansion of production in South and Central America and parts of Africa and Asia, but the actual course of production will be influenced by the trend of prices.

Coffee

The outstanding events in the coffee industry in 1959 were the steep increase in world output—from 3.5 to 4.5 million tons in the 1959-60 season—and the substantial rise in world imports—from 2.2 to about 2.5 million tons. More than 80% of the increase in world production is due to the record crop in Brazil, unofficially put at 2.5 million tons. Large crops were also harvested in Colombia, Mexico, India and the main African growing regions.

World consumption was stimulated by the general reduction in retail prices, relatively low consumer stocks and good economic conditions in the main markets.

Restriction of exports under the International Coffee Agreement has led to very substantial additions to stocks in producing countries; government-held stocks in the three largest producing countries increased by 1.4 million tons and in July 1960 were equivalent to one year's world consumption.

World output in the next crop year is likely to be substantially less than the 1959-60 record, which was only partly due to favourable weather conditions and reflects to a greater extent the coming into bearing of large new areas planted with high-yielding strains. Barring bad weather, this suggests a continuation of crops between 4 and 4.5 million tons annually in the years to come.

Although consumption of coffee will continue to rise, it is unlikely that the annual increase will exceed 5%. The proposal has been made to extend the International Coffee Agreement for another year and consider in the meantime the conclusion of an export agreement for five years, to provide time for producing countries to introduce measures of production control. Unless such measures are taken, stocks will continue to accumulate and could reach twice their present size in three or four years from now.

Rubber

In 1959 there was a further increase of 5% in the output of natural rubber. All major producing countries contributed to this expansion, with the notable exception of Ceylon, where there had been labour difficulties and excessive rainfall. The steady expansion in estate output continued in the Federation of Malaya and the advance in rubber prices stimulated some increase in production from smallholdings. In Indonesia there was increased marketing by smallholders, but on estates the declining trend continued.

Sales from stockpiles held by the U.K., the U.S.A. and the U.S.S.R. in

Table 1

Rubber: Production and consumption

	Average 1954-56	1957	1958	1959 (*preliminary*)
	Thousand metric tons			
Production:				
Federation of Malaya ..	627	647	674	709
Indonesia	734	696	678	717
Others	541	590	637	649
Total	1,902	1,933	1,989	2,075
Consumption:				
U.S.A.	607	547	492	564
Others	1,275	1,373	1,520	1,575
Total	1,882	1,920	2,012	2,139
Consumption of synthetic rubber	994	1,278	1,267	1,582

1960 were considerable and caused an easing of prices from the high level reached at the end of 1959, but expansion of demand, despite the increase of about 30% in synthetic rubber, has maintained prices.

There is little doubt that the long-term trend of demand for rubber remains upwards. But natural rubber production has for some years been running very close to capacity without holding its share against synthetic rubber of the expanding overall market.

While in some countries replanting and new planting with high-yielding material has been considerable, it appears that such further measures during a period of government stock-pile release would improve the prospects of holding this share.

incomes and a decline in prices of sugar relative to other foods. Both production and consumption are likely to increase in the next decade. Protectionist policies, which aim at saving foreign exchange and at diversifying agriculture, or which have been prompted by political and social reasons, are stimulating a new wave of expansion in sugar production in countries which until now depended on imports. Unless there are changes in national policies during the next decade, the increase in production may outstrip the growth of consumption.

Tea

Despite adverse weather in early 1959, world tea production was about the same as in 1958. The year's output

Tobacco being cured by air-drying in Libya. Facilities for flue curing are also available

Sugar

World production of centrifugal sugar in 1959-60, excluding Mainland China, is estimated at 48.4 million tons, slightly less than the record output of 1958-59, but well above the crops of other years. The smaller figure mainly reflects the effect of the 1959 drought on the beet sugar output of Western Europe, which fell by one million tons.

Sugar consumption in most countries has expanded rapidly in the post-war period in response to higher real

is currently estimated at 750,000-755,000 tons. World imports were about 30,000 tons below the 560,000 tons recorded in 1958. Requirements were thus in balance with supplies and no large carry-over stocks accumulated in producing countries.

Unfavourable weather reduced the Indian crop in the first half of 1960, but indications are that output will continue to rise everywhere. Production in Africa is steadily expanding, rehabilitation plans in Ceylon are beginning to be implemented, larger acreages have been planted in Pakistan and, in general, profitable prices in 1959 will stimulate improvements on existing plantations. World imports in 1960 are likely to recover or surpass the 1958 volume. In the longer term, however, expansion of production may overtake the gradual improvement in consumption, especially if Mainland China and Latin America enter world markets on a larger scale.

Tobacco

Production of tobacco increased slightly in 1959, the largest increases being in the Federation of Rhodesia and Nyasaland, where a record yield was obtained of flue-cured tobacco, and in the U.S.A., where the acreage expanded by 7% following the discontinuance of the Acreage Reserve Programme. Production in Italy continued its upward trend, but production in Greece fell considerably following the reduction in area, a consequence of the stock accumulation after the large 1957 crop. In Turkey there was a considerable increase in acreage. Cigar leaf output continued to fall and there are signs of a shift toward Virginia tobacco, especially in Cuba and Indonesia.

World tobacco consumption continues to rise. U.S. consumption of unmanufactured tobacco, which decreased owing to raw material saving innovations in manufacturing techniques and changes in taste in favour of products requiring smaller quantities of tobacco per unit (*e.g.* filter-tip cigarettes), is once again on the increase. U.K. consumption is estimated to have reached a record figure in 1959-60, one-fifth above consumption 10 years ago.

Fibres

Cotton

Both supply and consumption of cotton increased in 1959-60. Consumption was relatively steep in the U.S.A., Western Europe and Japan. U.S. exports are estimated at well over double last year's volume. The United Arab Republic, with its relatively large outlets in the U.S.S.R., reduced the official currency discount on export sales of Egyptian cotton and banned the export of certain qualities required for domestic mills. Other exporting countries appear to have moved their exportable supply with relative ease. Market prices rose for most growths;

Cotton. An Indian village woman carrying a load of cotton

those for extra long staple increased relatively steeply and the normal premium which they command over medium staples was restored.

Barring unfavourable weather, the 1960-61 season may see some increase in production; the present estimate is for 10.6 million tons, as compared with 10.27 million tons in 1959-60. Over the longer term, growing populations with rising standards of living will call for an increasing volume of fibre, especially in the more densely populated less developed regions. With the cost of cotton and its manufacture at competitive levels, and the products available on equal terms to consumers, cotton is more likely to share *pari passu* in the expansion of total fibre consumption.

Jute

Production of jute and allied fibres in 1959-60 is expected to reach 2.7 million tons, as compared with 2.8 million tons in the previous year. As rice prices were relatively favourable at planting time, farmers in Pakistan reduced jute acreage; also yields were not maintained and output is estimated to be 6% less than in 1958-59. In India the total production of jute and mesta fell by about 12%, mainly in rice-growing areas. A considerable increase in production of jute-like fibres was reported from Mainland China.

Prices of raw jute rose steadily from October 1959 after it became apparent that the Indian crop would be much smaller. The 1960-61 season opens with stocks in producing countries much reduced, but larger crops may be expected. In Pakistan the authorities have abolished the jute licensing system, except in a few special areas, and are promoting the planting of good qualities. Jute mills in India have agreed to operate a regular price support scheme for raw jute, should prices fall to levels discouraging to growers.

Hemp, sisal and henequen

At 845,000 tons, hard fibre production in 1959 was 36,000 tons greater than in the previous year. Abaca, at 233,000 tons, made a partial recovery from the setback of the previous year. Sisal production was 942,000 tons in 1959, as compared with 884,000 tons in 1958, and henequen 259,000 tons, as compared with 255,000 tons. Indonesian sisal production continued to dwindle and Haitian output may have levelled off as a result of drought, but production in British East Africa continued to rise and there was a spectacular increase in Brazil—119,000 tons, as compared with 105,000 tons.

A further, although less pronounced, rise in production of hard fibres seems likely in 1960. Moderate increases may be expected in the sisal output in Africa and Latin America, while abaca output will probably be reduced, owing to the cessation of production in Central Africa. Such over-all increase as may occur in 1960 should not result in an excessive volume in relation to consumption, in view of the expanding use of agricultural twines and the larger demand for cordage likely to result from the increasing activity in industry and shipping.

Oils and oilseeds

Preliminary figures for 1959 place the total production of fats and oils of all kinds at 30.7 million m. tons, as compared with 28.9 million m. tons in 1958. The forecast of production in 1960 places production at 31.1 million m. tons. Thus output in 1959 was 5% above that of the previous year. Most of the increase was in the U.S.A. and the U.S.S.R., but there was also an improvement of 8% in Asia, reflecting higher production in India and Mainland China and no further deterioration in copra production.

Primarily because of expansion in the U.S.A., the strong upward tendency in world supplies of slaughter fats and soya beans continued, and cottonseed oil supplies finally moved upwards from the stationary levels of recent years. Sesame and sunflowerseed crops were also good and linseed crops recovered from the poor 1957-58 out-turn. Olive oil supplies were excellent.

Coconut oil output, estimated at 1.8 million tons, was about the same as in 1958, but still 16% below the level of production before the widespread

Bananas. The Lacatan variety is resistant to Panama disease and is largely planted in the British West Indies

drought affected coconut yields at the end of 1957. Larger export supplies of other commodities, however, more than compensated in volume for the scarcity of copra and world trade in all oils and fats, at 7.8 million tons, was somewhat higher than the 1957 record. Importers have substituted liquid edible oils and slaughter fats for coconut oil, and the ample exports of soya beans, cottonseed, lard and tallow

in the U.S.A. allowed that country to increase fats and oils exports by one-third and thus obtain the largest share of the expansion in world trade. Shipments of soya beans from China were also higher and world groundnut exports were maintained as Nigerian stocks were available to supplement current production.

The production of margarine and shortening fats rose, but the expansion took place chiefly in countries not dependent on world markets for raw materials, such as the U.S.A. Western European margarine output recovered part of the decline since 1957, and shortening fat manufacture remained high, but there was some further moderate reduction in soap making. Soap output apparently reached a peak in 1957 and has since declined, indicating that synthetic detergents are now depressing the global volume of soap consumption.

The 1960 situation is similar, but with less strongly emphasised features. World output is expected to rise to a little over 31 million tons. Copra production has improved and supplies of soft oils, lard and tallow are again moderately larger. Reduced supplies of groundnut oil from last autumn's smaller crops in West Africa are more than offset by a further rise in U.S. output of soft oils and animal fats and by olive oil from the large Mediterranean harvest of 1959-60. The effect of a poor sunflowerseed harvest in the U.S.S.R. may be counterbalanced by increases in other oilseeds and animal fats.

Per caput food fat consumption may be close to the upper limit in major European importing countries, while population is rising only slowly in these countries. Butter production in the Common Market countries is expected to increase significantly and its disposal would also have to be in competition with vegetable oil products.

Fruits

Apples and pears

The 1959 output of apples in major producing countries—9.3 million tons—was one-quarter lower and that of pears—2.5 million tons—one-fifth less than the bumper crops harvested in 1958. Nearly all of this reduction occurred in Europe, mainly because of late spring frosts and summer drought. Apple production in North America was 7% smaller than the previous year, while U.S. pear production recovered from the low level of the previous year. Apart from a substantial increase in apple production in Argentina, relatively small changes occurred in Southern Hemisphere crops.

Citrus fruits

World production of citrus fruits expanded further in 1959-60 and is likely to exceed 20 million tons. The gain was mainly in oranges and tangerines. Total output in major producing countries is estimated as 11.3 million tons, compared with 10.8 million tons in 1958-59.

Bananas

International trade in bananas expanded further in 1959. Total imports are expected to approach 4 million tons. In the first quarter of 1960 shipments into some of the major importing countries continued to rise and were estimated at the previous year's level in some others.

Raisins and currants

World production of raisins in 1959 was 10% larger than the low output in 1958. Trade in currants remained at the previous year's level. Raisin exports from Turkey may reach 90,000 tons, which is double that of 1958-59. Greek exports to the U.S.S.R. and Eastern Europe may rise to 50,000 tons. U.S. exports are expected to rise significantly this season.

Dried figs and prunes

Production of dried figs in 1959 was substantially lower than in the preceding season. No major changes are expected in exports, however, as decreases in Italy and Portugal will be offset by larger shipments from Turkey and Greece, where the fruit is reported to be excellent this year, both in quality and size.

After the previous year's decline of one-third, the 1959 pack of dried prunes is expected to be the largest in several years. Exports from the main producing countries, which had fallen short in 1958-59 owing to a drop of 30,000 tons in the U.S. sales, are expected to rise sharply in the current season, probably exceeding those of preceding years.

Forest products

World roundwood production has remained very stable since 1956 at around 1,662 million cu. m. Fuelwood, however, declined by about 40%, while expansion in removals of

Pineapple. A Chinese girl harvests the fruit in the pineapple fields of Johore. Malaya exported over 27,000 tons of canned pineapple in 1959

Timber. Trained elephants being used in pairs to bring in timber in the teak forests of Thailand

industrial woods, interrupted in 1958, was resumed in 1959 with a 4% rise, reaching a total of 962 million cu. m. The improved economic situation is expected to bring an even greater demand for forest products in 1960.

With the additional output of 8 million cu. m. in 1959, production of sawnwood exceeded the 300-million mark for the first time. Although sawnwood consumption has not kept pace with population increase, and in some countries there was recently a decline in construction activities, it appears that 1960 will be no less favourable than 1959.

The steady post-war increase in wood pulp production, which was halted for the first time in 1958, was resumed in 1959 with a new record production of nearly 52 million tons. With further substantial increases expected in the consumption of paper products, pulp production and consumption should continue to expand rapidly in the coming years.

With an output of 12.6 million tons, world newsprint production resumed its upward trend interrupted in 1958 and increased by 4% to set an all-time record. The market situation for newsprint has been favourable in the first half of 1960 and, with growing population and great advances in literacy, medium- and long-term prospects appear to be good.

Shelter Belts in Canada

Seven hundred miles of field shelter belts protect eight townships in the exposed Saskatchewan wheatlands, and over 6 million trees already planted in this area have proved that 'north-south' rows are the most effective.

This 24-year project was begun in 1935 when the Prairie Farm Rehabilitation Authority demonstrated tree planting on a 63-sq.-mile area at Conquest, Saskatchewan, the purpose being to encourage farmers to plant trees for shelter belts and roadside hedges in order to reduce wind erosion of soil and snow drifting, facilitate winter travel and add beauty to the countryside. The plan was successful and it is estimated that approximately 4,000 miles of shelter belts have now been planted in the province.

While not a complete cure, these belts are a tremendous help and the trees do not interfere with farming operations. Spraying for weed control can be carried out under the branches without any harm to the trees. The snow trapped beside the trees adds moisture reserves which improve crop growth.

The value of these shelter belts cannot be measured in dollars and cents. With an estimated tree life of 50 years, the total cost per acre is 4 cents, which is covered by Government grants. Payments are made on the following basis: to cover cost of planting and maintaining the trees; one half of the purchase price of a tree-planting machine; one half of the purchase price of grass legume mixture for seeding the area between the roadside hedges and edge of the cultivated areas. The farmer has to provide the labour for planting, and the machinery for occasional cultivation. The trees are provided free by the forest nursery stations at Indian Head and Sutherland.

Control of Plant Disease

C.S.I.R.O. scientists are interested in the possibility of producing fungicides which, like antibiotics in humans, might spread through plants and give complete immunity to disease.

One of the biologists who worked on the discovery, Mr. I. A. M. Cruickshank, said that plants developed a resistance to disease, just as humans and animals did. While a great deal was known about immunity in animals little was known of the way in which plants resisted disease.

Dr. D. R. Perrin and Dr. W. Bottomley, of the Division of Plant Industry of the Australian C.S.I.R.O. told a meeting of the discovery of pisatin, a substance produced by plants in response to fungal infection.

It might be possible to produce chemicals similar to pisatin which could be used to spray plants to protect them from plant diseases.

The samples of clean seed are grown in plots which are generally near the Institute (seen in the background) to check varietal purity

Production of High Quality Seed

H. N. GREENWOOD, B.SC., and D. H. PETO, PH.D., B.SC.*

The production of high quality seed is an essential part of an efficient agricultural system, since it forms a basis for productive and reliable crops.

HIGH quality in seed implies mainly that the seed shall germinate to produce plants as similar as possible to the form of the variety evolved by the breeder and shall be free of contamination by other kinds of seeds. Quality of physical characters, such as shape, size and colour, which are often used in judging the commercial value of seed, are much less important.

The *National Institute of Agricultural Botany* is involved in the multiplication and distribution of seed of agricultural and horticultural crop varieties bred at some of the official plant breeding stations in the U.K. The *Agricultural Research Council* have advised that organisations under their control and concerned with plant breeding should address themselves primarily to this aim and should leave the more extensive multiplication of seed of their successful varieties to the N.I.A.B.

So that the purity of varieties is preserved, the number of generations of multiplication between the plant breeder and the seed merchant and grower must be restricted to the minimum, since the handling of each successive seed crop on an ever greater scale increases the risk of contamination and departure from the original characters in the basic material.

The methods used by the Institute to produce adequate supplies of seed of the kind and quality required by the farmer vary slightly according to the crop. Basically, however, they all require: 1. A relatively small input of seed by the breeder. 2. The multiplication of this seed through one, or sometimes, two generations by the Institute. 3. The sale of this seed to merchants for further multiplication under approved schemes which are mainly supervised by another branch of the Institute.

This close co-operation has proved very successful, since the breeder is required only to maintain his variety, while the N.I.A.B., which could never produce by itself all the seed needed by the growers, is helped in its multiplication by the voluntary co-operation of the seed trade.

The scale of seed multiplication by the Institute is shown in Table 1, which gives the quantities of seed distributed in 1959-60.

In all efficient seed multiplication schemes there are certain principles which must be observed. They are mainly application of common sense and attention to detail at all stages.

* Seed Multiplication Branch, National Institute of Agricultural Botany, Cambridge.

Firstly, the quality of the seed supplied by the breeder must be beyond reproach. Secondly, it must be sown with a clean drill on land where previous cropping, weed population and location will not allow contamination of the growing crop with seeds which are difficult to remove. Thirdly, when ripe it must be harvested with machines that are scrupulously clean into clean bags bearing labels to show accurately its identity.

Table 1
Distribution of pure seed

Type of crop	*No. of varieties*	*Quantity of seed*
Cereals ..	3	237 tons
Pulses ..	1	4½ ,,
Grasses ..	14	130 ,,
Clovers ..	4	9 ,,
Vegetables ..	11	52 lbs.

Seed processing

The seed is then dried, if necessary, and conveyed to the seed-processing plant. When it arrives at the granary it is immediately sampled for moisture content and a sample is drawn for purity tests by a qualified seed analyst.

If in a satisfactory condition, the parcel of seed may then be stored until all deliveries of the same variety have been received, so that they can be cleaned successively on the same group of machines. The subsequent cleaning down of a set of machines between different varieties is a very exacting and tedious operation which may take up to two days, so the need for bulk treatment can be appreciated.

During the cleaning of each lot of seed, its identity is maintained and samples are drawn at various stages of the different fractions of seed. These are analysed so that the efficiency of the operation can be judged and adjustment made to the machines, if required.

Seed testing and proving

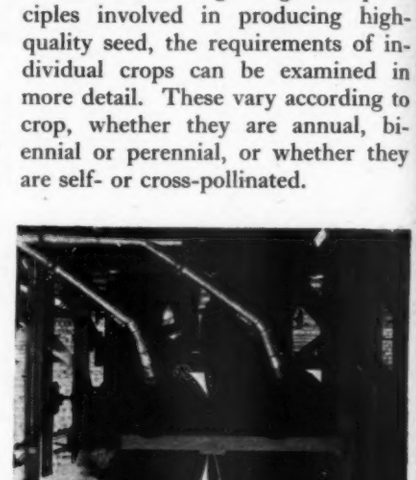
When the seed is finally approved for purity it is stored in sacks, the seed of each variety being held in different parts of the granary to avoid accidental admixture. Labels showing the exact source of the seed are attached to the sacks, which are again weighed and sealed before distribution to growers. At this point a further representative sample of seed is drawn for laboratory analysis and a growing on test in the field.

Although there is an increasing demand for the employment of bulk handling methods of seed in commerce, the Institute is likely to continue to use sacks for the movement and storage of seed. The extensive use of sacks, however, requires careful supervision in order to ensure that seed of one variety is never put into sacks which have been used for another variety, even if the sacks have been cleaned.

In order to reduce the risk of this occurring, sacks are branded with the name of the variety and in some cases a colour code is used in addition. When the seed is finally despatched to growers, it is sent out in non-returnable sacks in order to avoid the hazards of re-use.

Individual crop requirements

After considering the general principles involved in producing high-quality seed, the requirements of individual crops can be examined in more detail. These vary according to crop, whether they are annual, biennial or perennial, or whether they are self- or cross-pollinated.



The seed is cleaned to a high standard of purity. The subsequent cleaning down of one of these machines is an exacting and tedious operation

Cereals

The main crops coming under this heading are wheat, barley and oats, all of which are annual and self-pollinated. As far as practicable, these crops are grown on the Institute's own 650-acre farm near Cambridge. However, this is not always possible, since the risk of infestation with wild oats—common in Eastern England—necessitates the multiplication of oats by growers in other areas.

For the cereal seed crop, land must have been free of cereals for at least two previous years in an arable rotation and farmyard manure must not have been applied during this period. If the preceding crop has been grass, at least three and preferably four years are required and livestock must not have been fed with straw or corn while on the grass.

When the field is approved for growing the seed crop, every care is

Laboratory analysis of a sample of Proctor barley

taken to ensure that it will be free of contamination and can grow, for example, three successive crops of spring barley or an eelworm-resistant winter oat. This means that all implements must be cleaned before travelling from one field to another, trailers must be regularly swept down, farm haulage operations must be planned carefully in order to avoid, for instance, the carting of straw of one variety across the field growing another variety.

The crops are commonly sown with a blanked-off coulter in the middle of the drill in order to provide regular divisions for 'roguing'. About a dozen students are employed in July and August for this purpose, 'walking the crops' two or three times and removing off-types and other rogues. The harvest period is always one of stress and urgency when mistakes are liable to occur, so strict supervision of operations is vital.

Ample combine strength is needed, and where a fair acreage of any one variety is to be harvested (*e.g.* 100-150 acres) a new combine may be hired to deal only with this particular variety. It is also essential that every bag of seed should be accurately labelled before it leaves the combine.

Grasses and clovers

The methods outlined are those used by the N.I.A.B. in the multiplication of stock seed of the 'S' varieties bred by the *Welsh Plant Breeding Station*, Aberystwyth.

The Welsh Plant Breeding Station supply foundation seed direct to growers selected by the N.I.A.B. The cropping history during the previous six to eight years is carefully examined and an inspection made of the fields before ploughing or other surface cultivations to ensure, as far as possible, freedom from plants of other crops and from weeds whose seeds would be difficult to separate from the main crop seeds. In addition, enquiries are made as to the likely cropping in the harvest years of surrounding fields so as to safeguard the crop from cross-pollination.

An agreement is made with the growers for the produce from the first two harvest years, provided that the crop in the field is up to the required standard of purity. (After these two years the grower may, if he wishes use his stand for the production of certified seed under an official scheme.) The ryegrasses and clovers are usually sown as a broadcast stand, while the cocksfoot, timothy and fescue varieties are sown in rows about 18-20 in. wide.

The cleaned seed, in sealed sacks, being sampled before despatch. A sampling spear is thrust into each bag and a sample is taken for analysis

In order to protect varietal purity a stock seed grower of S.48 timothy, for example, must guarantee not to sow any other variety of timothy on his farm for any purpose whatsoever. This requirement safeguards the seed crop against cross-pollination and ensures that, as the seed crops rotate round the farm, the possibility of contamination from ground keepers† is reduced.

During the summer in which the crop is to be harvested, staff from the N.I.A.B. rogue the crops to remove any genetical off-types and plants of other grasses whose seeds would be difficult to clean out. The crops are harvested by the growers, the seed being returned to the N.I.A.B. for further processing. This seed, now known as stock seed, is available for distribution for a further stage of multiplication to produce certified seed.

Vegetables and sugar-beet

The vegetables are mainly brussels sprouts and winter and summer cauliflowers, and these, with sugar-beet, are biennial crops which are cross-fertilized. The quantities required by the seed trade for further multiplication are small, but the need to provide good isolation to prevent contamination presents a constant problem. With brussels sprouts, for example, between 1,000 and 2,000 plants are mass selected and transplanted into an area which has been first surveyed to ensure reasonable freedom from contaminating crops.

In the spring a detailed inspection is made of every field and garden within a mile radius of the seed crop and owners of plants of related species are asked to remove them. Even so, contaminating hybrids may still be found in a growing-on test conducted before the seed is released for further multiplication. Investigations involving variation in the size and shape of seed crops are now in hand to find out whether hybrid contamination can be completely eliminated.

Establishing a seed reserve

The demand for seed supplied by the Institute is fairly predictable from year to year and is subject only to relatively small changes reflecting alterations in the popularity of varieties. The supply of seed, however, fluctuates violently, especially in such crops as the clovers and brassicas. In order to deal with this problem and to equate supply and demand, a seed bank has been set up so that surpluses produced in one year can be held over to supply years when yields are low. The aim is to store up to five years' supply of clovers and brassicas and about one year's supply of the grasses.

The seed scheduled for storage must be in very good physical condition with a high germination. It is then dried to about 8% moisture and

† Ground keeper: A plant arising from a seed or tuber of a previous crop.

stored either in airtight tins in a refrigerator at O°C. in the case of clovers and brassicas, or in sealed polythene sacks for the grasses. For example, stocks of perennial ryegrass and cocksfoot have been found to have lost only 1% or 2% in germination after four years. Tomato seed held in tins for seven years still has a germination of over 90%. It is only by the use of such methods that adequate stocks of seed can be held in reserve to offset unfavourable harvests and so ensure continuity of supplies.

Pure seed expensive

The N.I.A.B. recognises that the production of high-quality seed is a more expensive process than the production of the lower grades of seed used by the farmer, where the standards are less exacting. The farmer who grows seed for the Institute has to be constantly planning his rotation in order to provide suitable land and may have to sacrifice more remunerative crops in order to meet the requirements for previous cropping. He must also be prepared to allow Institute officials to walk through the crops, which may cause damage, and in some cases he must remove any rogue plants found.

He must also be willing to arrange for his drilling and harvesting machinery to be inspected, and to provide good facilities for the short-term storage and drying of his seed under conditions that will not permit accidental admixture. He must be prepared for part or all of his crop to be rejected for seed, if it fails to reach a reasonable standard of purity on inspection. In order to compensate the grower for this, and to achieve the maximum co-operation so necessary in this work, the Institute pays him 25-50% more than he would receive for seed grown for commercial purposes.

Every delivery of seed must be properly identified by labels issued to the grower

To this relatively high price paid to the grower must be added the costs of cleaning the seed to the highest possible standards. As no known purities are permitted in the final sample, the cleaning process may be very intensive and laborious to remove, say, wheat from barley or ryegrass from cocksfoot. Since the seed is so valuable, losses in cleaning must be as small as possible and this may be achieved only by several separations which would be uneconomical for the commercial seed distributor. Consequently, the final product is sold by the N.I.A.B. at a price two or three times higher than the price of normal farm seed of the same variety.

Summing up

The whole programme of multiplication aims at preserving the highest possible standard of genetic purity of varieties whose value to the agricultural industry has been proved. This cannot be done cheaply, but it must be remembered that the cost of seed represents only a relatively small proportion of the total cost of crop production.

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Cover Crops for Rubber

Leguminous creepers are the most common cover plants used in rubber cultivation, but they are expensive to establish and to maintain. Consequently, a less costly mixture of grasses and the non-leguminous creeping *Mikania scandens* is sometimes planted, or a selected 'natural' cover of mixed indigenous bushes, herbs, ferns and creepers is encouraged.

The Rubber Research Institute of Malaya has recently reported on experiments relating to the value of these alternative covers. They found that a cover of leguminous creepers—a mixture of *Pueraria phaseoloides*, *Calopogonium mucunoides* and *Centrosema pubescens*—contained far greater quantities of nitrogen than did either grass or *Mikania* covers.

Although the quantity of green material in all three cov rs was lower at the second sampling (18 months after planting) than at the first sampling (12 months after planting), the quantity of litter under the mixed leguminous creepers increased by over 80% in the six months between sampling, whilst the litter under the two green non-leguminous covers actually decreased during this period.

The litter mulch under the mixed leguminous cover, still accumulating, will persist for some time after the legumes have been shaded out by the developing *Hevea*. Analysis showed that between the two samplings the total nitrogen content of the leguminous cover (green material and litter) increased from 244-320 lb. per acre, while that of the grass cover remained constant and that of *Mikania* cover actually decreased.

The extra nitrogen contained in the leguminous cover, when compared with that contained in the grass and *Mikania* covers, was equivalent to about 1,200 lb. per acre of ammonium sulphate. While too much should not be made of this direct comparison of organic nitrogen with mineral fertiliser nitrogen, because the former is only slowly available to the tree, yet appreciable differences in the effects of the two covers on soil conditions and tree growth appear likely.

The build-up of litter and of nitrogen content has always been used as an argument in favour of using leguminous creeping covers and it is interesting at last to obtain this confirmation. However, a full assessment of the value of these investigations must await observations of the effect of the covers on tree growth and yield.

FAO Seed Campaign

R. O. WHYTE AND J. J. DE JONG*

This article tells the story of a combined operation on an international scale designed to increase the productivity of the earth, for better seed must inevitably bring better crops where farming methods and other conditions are satisfactory.

A VERY important outcome of the current development of technical assistance on a global scale—this awakening of the world's conscience with regard to the needs of the less-favoured and so-called under-developed countries, which has now been in progress for two or three decades—is the realisation that scientific progress is still more rapid in the countries which were already more advanced when the operations began.

With the two different rates of progress which exist, even in some cases within individual countries, and in spite of the large amounts of money, manpower, planning and effort which have been devoted to technical assistance, the gap in degree of agricultural advancement is widening rather than diminishing.

For this reason it is considered appropriate from time to time to supplement the routine activities of the United Nations Food and Agriculture Organisation (FAO) by more intensive work in fields which appear to be especially promising and demanding. Most of these activities are of a regional nature and lead to the formation of a working party or the holding of a training centre, but others, such as the World Seed Campaign or the Freedom-from-Hunger Campaign, are global in scope.

There is probably no aspect of world agriculture in which the discrepancy between the advanced and the less advanced countries is more apparent than in matters relating to the provision of seeds of improved crop cultivars.† There are countries in which all the necessary facilities are available—plant introduction stations, plant breeding institutes, arrangements for the multiplication, evaluation and distribution of high-quality seeds, advisory services trained and equipped to pass the news to the farmers and, finally and most important, a farming community fully able to realise the merits of the material being provided for its benefit. There are, on the other hand, countries where practically all these facilities and favourable factors are lacking.

Better seed; better crops!

Purpose and objective

The overall objective may be said to be twofold: to induce the 88 member countries to look at their present seed situation in the light of the scope and aims of the campaign and to try to improve it and, secondly, to consider whether they have any special knowledge and experience which they might be able to pass on to help others. Even to induce people to think about some of the possibilities may represent a novel operation—to do

* Crop Production and Improvement Branch, FAO, Rome.

† Cultivars: varieties

FAO agronomist, Mr. Peter Oram (left), *with Mr. S. Conti, manager of the Zaviet Experimental Station, Libya, examining improved strains of bulrush millet,* Pennisetum typhoideum. *This crop is used as a substitute for barley, but local strains are very poor and cultivation methods backward*

something about them, however small, represents a contribution to the campaign on a national, regional or global basis.

Training and equipment

It is probably in the interchange of knowledge and experience that the most constructive and rapid contribution will be made in the reduction of the widening gap between advanced and less advanced countries and in the acceleration of the rate of progress in the field of seed improvement in the widest sense.

Several governments have already offered training facilities, fellowships and experts to countries where more qualified staff is needed for the development of seed improvement programmes. For instance, Canada arranged a three months' course on seed improvement in the summer of 1959 for trainees from the Colombo Plan countries, and this was repeated in 1960. Last year Sweden held a seven months' training centre on genetics and plant breeding for selected trainees recruited from the countries of the Near and Middle East, with also India, Pakistan and Ceylon. Other countries, such as Australia, the Netherlands, Italy, the U.K. and Denmark, have announced that they will provide similar training facilities for 1961, each in their own specialised fields and for their particular crops.

Many international, regional and national organisations and agencies—both governmental and non-governmental—have also been actively associated with this aspect of the campaign. For example, the Organisation for European Economic Co-operation (O.E.E.C.) has provided various publications which give information on the production, control and distribution of high-quality seed in European and some overseas countries. The International Seed Testing Association (I.S.T.A.) has established a panel of international seed experts who are prepared, if required, to assist and advise countries on seed - testing methods, equipment and related matters. The U.S. International Co-operation Administration (I.C.A.) has planned for 1961 a series of training courses and seminars of varying duration on seed technology and related subjects in the Near East, Far East and Latin America. FAO is assisting in the interchange of information on plants and seeds through the medium of the Plant Introduction Newsletter, which has a world-wide distribution.

In September 1960 the United Nations Scientific, Social and Cultural Organisation (UNESCO) launched a special gift coupon project in support of the FAO World Seed Campaign. This project is designed, through the grant of gift coupons donated by sponsoring organisations, charity groups and generous interested individuals, to supply selected countries with technical equipment, such as seed-cleaning machinery and seed-testing laboratory units, as well as with educational materials, such as films, projectors, screens and technical publications.

Utilisation of world resources

The term 'seed', as used in the title of this campaign, is given a very broad connotation which involves beginning with the genetic composition of the plant material of which high-quality seeds are to be made available to the farmer. This means that we begin with plant exploration and introduction, a whole vast field of crop improvement in itself. It is a subject in which all countries are interested and stand to gain in different ways and at different levels. There is hardly one of the established crops in which new genes from wild species and primitive forms are not required to increase yields, improve resistance to pests and diseases, or to extend the zones of adaptability.

The main aspects of current international significance relate to collaboration in expeditions and the sharing of their proceeds; the need to establish special research and other facilities within the zones of maximum variability; the need to protect the natural vegetation and the valuable genotypic material in and around these zones from destruction by excessive grazing, cutting, burning or clearing for cultivation; and a general wish among plant breeders for the establishment of facilities for the maintenance of valuable wild forms or primitive cultivars for future reference.

FAO's limited work to date in this field will culminate in the convening of a technical meeting on plant exploration and introduction in Rome in July 1961. Specialists throughout the world have been consulted with regard to the general objectives of this meeting and the most valuable advice which has been received will be fully considered

when preparing the agenda. All the member countries of FAO will be invited and observers are also expected from other countries.

Crop improvement

A cultivator can himself improve his farming methods or his technique for irrigation, but for his basic planting materials, his seeds, plants or cuttings, he depends upon whatever is made available to him. The improvement of cultivars is primarily the concern of government agencies, although also of non-governmental bodies or private breeders, who can conduct plant-breeding programmes designed to produce the types of cultivars needed.

Since crop improvement represents a major segment of the World Seed Campaign, it has proved to be very useful that the National Seed Campaign Committees contain at least one representative from a plant-breeding institute or similar organisation. The improvement of facilities for crop improvement is one of the more important ways in which a country may contribute to the objectives of the campaign.

It is regrettable that in those countries, chiefly in the tropics and subtropics, where crop improvement is probably most necessary at the present time, these activities make an insignificant contribution to the objectives of the campaign. Fortunately, there are a number of projects conducted under the auspices of FAO, or other agencies and foundations, which can be regarded as incidental and important contributions to the World Seed Campaign as such.

In the selection of crops to which attention is to be given FAO naturally tends to concentrate on the major food crops which provide carbohydrate and vegetable protein for direct human consumption. It also promotes international action and collaboration on the protective and vitamin-rich food crops —the fruits and vegetables—the pastures and fodder crops, which are the basis of the production of animal protein, and the industrial crops which permit a country to have a higher standard of living than from subsistence crops alone. Some examples of long-term projects which will continue long after the World Seed Year 1961 may be mentioned.

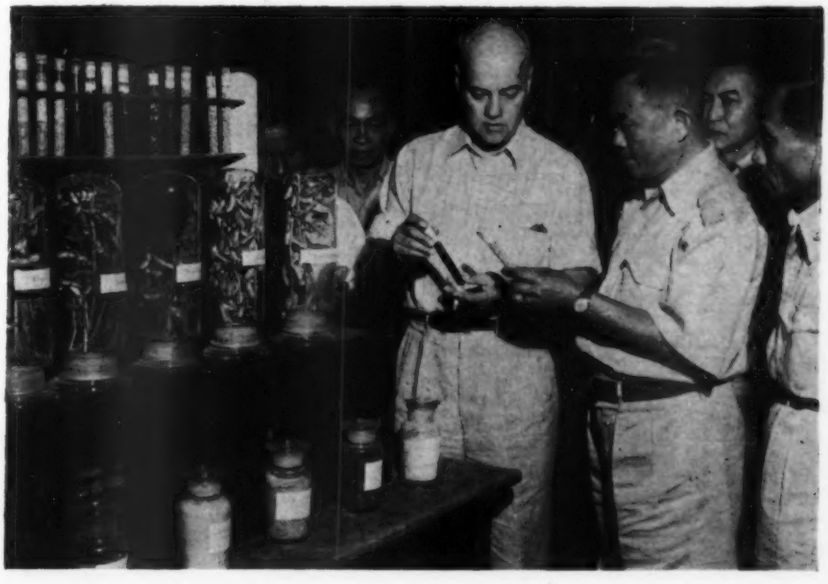
Dr. H. Douwes, of the Netherlands, FAO cotton production specialist, with Mr. Mohamed Dyvad Abedi, one of his Iranian co-workers, inspecting comparative variety trials at the Varamin Government Research Station in Iran

Individual crops

First, as regards *wheat*, the Near East Wheat and Barley Project is being expanded and accelerated, in association with Colombo Plan, the Government of the Netherlands, the Rockefeller Foundation and the governments of the region, with the object of improving efficiency of production of the basic food of 130 million people. In addition, excellent results have been obtained under FAO auspices from the introduction of Italian varieties into Yugoslavia. In the New World, the outstanding success achieved by the Rockefeller Foundation in association with the Government of Mexico is based on improved cultivars and better methods of cultivation, fertilisers and irrigation.

The work on *rice* on the part of the member countries of the International Rice Commission Working Party on Rice Production and Protection will do much to improve the efficiency of production of this basic food crop, particularly in South-East Asia and the Far East.

The current trends are now towards



Mr. W. H. Cummings, regional representative of FAO in Thailand, describing the differences between various samples of paddy seed

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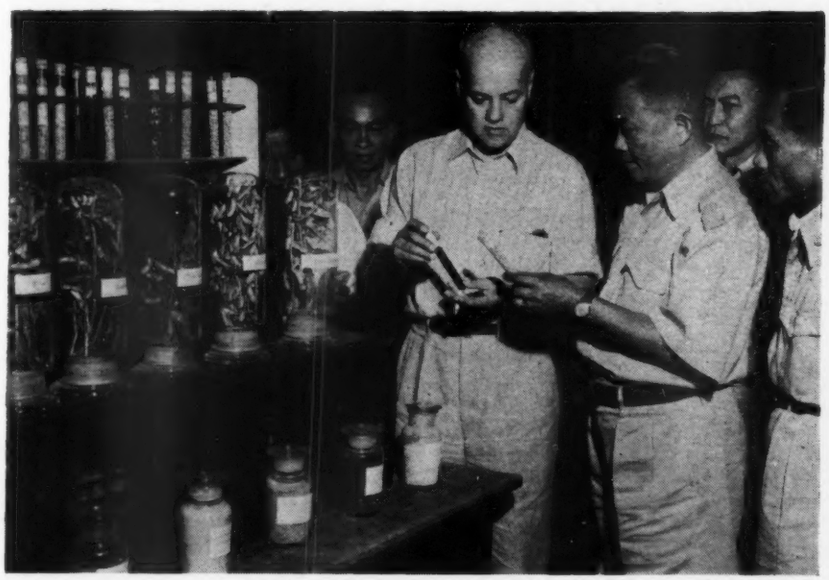
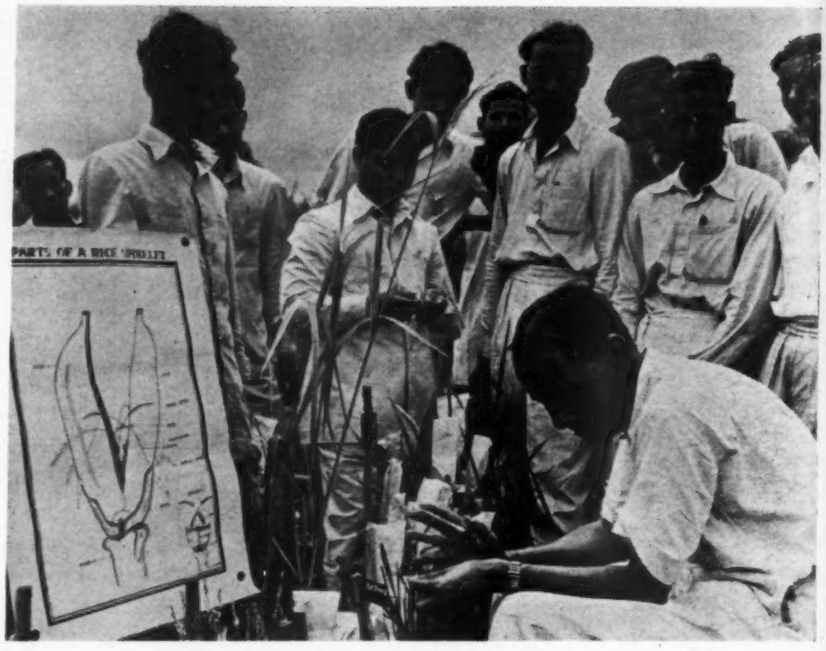


Mr. W. H. Cummings, regional representative of FAO in Thailand, describing the differences between various samples of paddy seed

a reduction in the number of varieties, the evolution of varieties resistant to blast and other diseases and pests and of varieties less restricted to limited ranges of photo-period, varietal response to fertilisers, and the introduction of more diversified cropping systems to provide a more balanced diet for the people, as well as maintaining a higher level of soil fertility. Important specifications include the introduction of improved varieties and cropping methods into the Egyptian region of the U.A.R. and Tunisia, and the establishment of an International Rice Research Institute in the Philippines.

Throughout the tropics and subtropics, where animal protein is not a normal part of the diet, or where it is still somewhat of an expensive luxury, the grain *legumes* or *pulses* for direct human consumption represent a first step away from the predominantly carbohydrate diet provided by a monocultural system of agriculture. At the present time it is particularly in Africa south of the Sahara, that FAO is promoting the improvement of these crops and the extension of the area of cultivation. If funds and staff were to become available, it would be highly desirable to initiate similar projects in the equally important regions of Latin America and South-East Asia.

The ultimate result of all the current and planned work on these and many other crops will be the creation of a need to work out efficient systems of seed production, authentication and distribution, so that farmers may reap the benefits as soon as possible. An incidental sequel is the fact that they will, at the same time, have to develop improved cropping systems and greater use of organic and inorganic manures and fertilisers so that the new superior cultivars may be able to realise their full potentialities.



Demonstration in the field is one of the best methods of training. Here different varieties of rice plants are being described at the Cuttack Station in India

To achieve maximum benefits from crop improvement it is essential that each country provide adequate facilities for seed multiplication of improved varieties in order to make sufficient quantities of high-quality seed available to the farmers at reasonable prices. It appears that substantial increases in crop production can be obtained, even with existing farming practices, through the wider use of seed of improved varieties.

This is particularly true of the less-developed countries, where too often such varieties are little used because the farmer is not aware of them or has not been convinced of their superior merits, or because the seed is hard to obtain. The improvement of this situation is another major objective of the campaign.

Dr. C. L. Pan, FAO rice expert in Egypt, and two officials of the Gemmiza Government Experimental Station inspecting a rice nursery

National seed organisations

An all-round organisation for the production, control and distribution of seed in a country must be built up stage-by-stage. Many different methods have been used, their success mainly depending on local conditions and the historical development in the respective countries. In many instances the government has taken the initiative for multiplication and distribution of improved seeds; in others farmers themselves have formed seed growers' associations which carry out most of the work involved. Where a reliable

seed trade or farmers' co-operative already exists in a country, these agencies have usually been engaged to assist in these activities.

From the very beginning it should be understood, however, that seed production is a specialised enterprise which needs careful planning and skilled operation; it is not just a haphazard business to be undertaken by anyone in a favourable season. Apart from the ecological conditions which may influence the possibilities of developing efficient seed production in any given country, there are many agronomic aspects which need special attention, such as seedbed preparation, application of fertilisers, weed control and harvesting methods.

In many cases a certain degree of isolation of the seed crop is necessary to avoid contamination during the growing period and to prevent mechanical admixture at harvest. Roguing of off-type plants and noxious weeds is also essential in the production of pure seed. For many leguminous seed crops it may be necessary to place beehives in fields to ensure pollination. In drier regions, irrigation must be applied to obtain high seed yields. Repeated sprayings with chemicals, disinfectants or protectants are also often necessary.

Particularly in the tropics and subtropics, more modern methods and equipment must be evolved for the harvesting, threshing and cleaning of seed. In arid climates, where there is no immediate danger from rain, seed storage in unprotected heaps may be sufficient for short periods, but storage in bins or tanks is the best method in most regions. In countries where seed growers' associations, seed co-operatives and/or private seed firms have already been established the operations of seed cleaning and storing should be taken over gradually by these agencies.

Seed certification

In order to ensure that the seed bought by the farmer is of minimum quality, particularly with regard to varietal purity and germination capacity, the introduction of a seed certification scheme is an essential step towards further improvement. Seed certification is normally conducted either by an incorporated non-profit organisation of seed growers or by a government agency and is usually based on special legislation.

Each certifying agency sets up minimum certification standards for each kind of seed crop, the requirements being based on practical experience; these may be raised progressively when the seed growers become more experienced. Usually a certification scheme is initiated for the most important crop of a country; as soon as a scheme has gained the confidence of all interested parties it may be broadened to include other crops or groups of crops. Each country must naturally relate its regulations to its own particular conditions.

Seed distribution

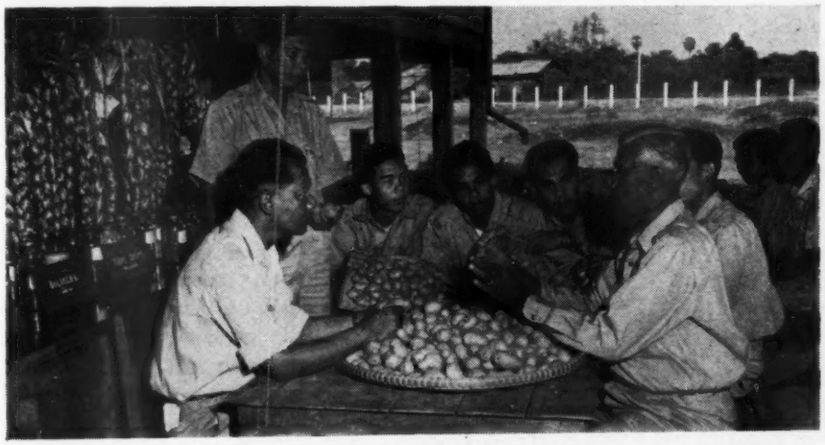
If there is little or no market for improved seeds, it may be necessary for the government first to sell the seed at a price below the production cost, or even to distribute it free of charge. To make the farmers more aware of the potentialities of better seed, and to build up a demand for it, a strong and well-planned programme of extension and education is also needed. However, no country can contemplate embarking on a seed improvement programme before ensuring that sufficient qualified personnel are available to carry out the different tasks and successive steps involved, both in the technical and educational fields.

World Seed Congress in 1962

All the present indications are that both the farming community and the general public will, by the end of the World Seed Year, be much more aware than hitherto of the great contribution which good seed of improved cultivars can make to agricultural progress.

With its relatively simple organisational structure and limited budgetary resources there is no doubt that the FAO World Seed Campaign will be a success within the limits set. This is due primarily to individual efforts in member countries, which are ensuring that knowledge and experience is being made available by those in the more favoured countries, and that full advantage is being taken of this assistance by the less developed countries.

The culmination of these united efforts and of the campaign will be the World Seed Congress, which is to be organised by FAO and held in Rome in 1962. This will review the progress made and consider future plans, for this great work, once started, must go on. There can be no end.



An Indian agronomist, Balakrishnan, from FAO is describing varieties of potatoes to students in Thailand

Soil Survey in Pakistan

A country-wide soil survey is to be carried out by the Government of Pakistan, with the assistance of FAO experts.

The survey—one of the largest of its kind ever undertaken—will run for six to eight years and will include aerial photography, field work and the collection and examination of soil samples.

An area of approximately 140,000 square miles is to be surveyed during the next four years. The rest of the country will then be surveyed by Pakistanis who will have gained the required training and experience under the experts and will carry on the work after the FAO team has left.

*Eucalyptus**

A Valuable Tree Crop

Review by F. C. COOKE

This is a short review of a new book which is being published in the WORLD CROPS *Series. The first author, probably the world's leading expert on the eucalyptus tree, has published more than* 100 *papers on essential oils. His associate is the author of several books on the flora of Australia.*

THE story of the eucalyptus, a group of evergreen trees and shrubs, began in 1770, when Joseph Banks, the botanist, collected the first specimen known to science—*Eucalyptus gummifera*—on the shores of Botany Bay during Captain James Cook's first voyage to the Pacific Ocean. It was not until 1789 that the first description of a Eucalyptus species was published and this name was proposed by Charles L'Héritier, a French botanist.

Many varieties

No Australian genus has been more thoroughly investigated by systematic botanists. There are over 600 species, although fewer than 200 are of economic importance. Nevertheless there is a wide choice to suit a varied range of climatic and soil conditions.

Some species are at home near the sea, some prefer the arid regions of the interior, while others even thrive on the snowline of the Australian alps, or cling precariously to the side of the picturesque gorges in the National Parks. Some flourish in areas where the rainfall is over 100 in., and others prefer more arid regions with less than 10 in. of rain per annum. They grow in soils ranging from poor sand to rich loams.

Eucalyptus trees are indeed the dominant feature of the vegetation of Australia and as individuals represent about three-quarters of the total flora. They range from dwarf shrubs, found mainly in sandy deserts, to the forest giants of Queensland and New South Wales.

World-wide introductions

The variety, adaptability and usefulness of the eucalyptus have caused them to be introduced into many countries. Argentina, Brazil, China, Congoland, Ethiopia, Guatemala, Uruguay and the U.S.S.R. have shown a growing interest in the essential oil-yielding species.

A lone example of the Australian gum tree, variety E. maculata, *growing on the north coast of New South Wales*

Felling a giant of the forest. The 'spring-boards' on which the 'fellers' stand raise them above the flare of the butt

* 'Eucalyptus'—by A. R. Penfold and J. H. Willis, WORLD CROPS Series, No. 4. Pp. 480. Illus. Leonard Hill (Books) Ltd., Eden Street, London, N.W.1. 1961. Price 65*s*.

Snigging a log to dump by means of a tractor

Other countries, including Iran, Iraq, Israel and Ethiopia are more interested in the quick-growing species which will produce firewood, poles and timber for building and pulp for paper-making and rayon production.

For the agriculturist, these quick-growing trees are useful for retaining highly erodable hillside soils, as in Hawaii, and as wind-breaks and shade trees for protection of crops in India, Ceylon and many other countries.

Valuable timber

The eucalyptus produces some of the heaviest, hardest and most durable woods known. The quality of the timber, coupled with its rapid growth rate, regenerative powers and size, makes this genus the most valuable source of hard wood in the world.

However, only about 60 species, or 10% of the total number of species known, are important as sources of timber. Some of the others may produce useful timbers but, because of their smallness or rarity, they are of little economic importance.

The timber is used for such diverse purposes as building construction, railway sleepers, fence posts, pit props, wharf timbers, bridging, plywood, veneers, box-making, matches, farm implements, musical instruments, boat-building and furniture making.

Logging practice

Logging practice varies but follows the usual sequence of felling, cross-cutting, 'snigging', loading and haulage to the sawmill. Snigging is the dragging of individual logs from the tree stump to the loading point.

In the early days the power unit was either a team of 16-20 trained bullocks, yoked in pairs to a central towing chain, or a smaller team of horses. But in times of drought, the condition of the animals so deteriorates that their pulling power is much reduced. Apart from this, the rains may make bush roads and access tracks so boggy and impassable that except on rocky mountain slopes, it is better to use a crawler tractor.

In felling, due care is taken to drop each tree where it can do no damage to other trees and where it is most convenient for cutting later. Naturally, the work is harder if axes are used, even though the 'fallers' are speedy and efficient. Nowadays the use of power-driven chain saws is usually the preferred method of felling.

After felling, the logs are cut into lengths with power-driven or ordinary, cross-cut saws, and for snigging, the forward end of the log is bevelled with an axe to reduce drag. Steel tongs or grabs are driven into the log to take the pull of the chain or hawser and it is hauled by tractor to the loading ramp.

From here it is rolled on to the lorry, wagon or trailer with the aid of a horse, bullock, truck, powered winch or tractor dozer blade and the completed load is then taken to the sawmill. In mountainous areas the logs may be dragged by cable through the bush; in other areas, there may be rail transport, powered by horses, by diesel engines or steam locomotives.

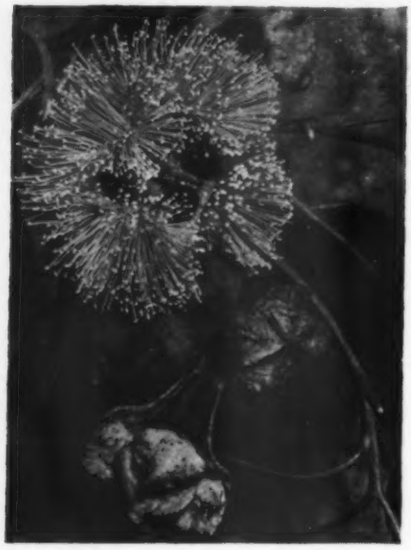
Valuable essential oils

Eucalyptus oils, distilled from the wood, have many applications and uses. Those rich in cineole, provide an active ingredient of inhalants, embrocations, soaps, gargles, sheep dips,

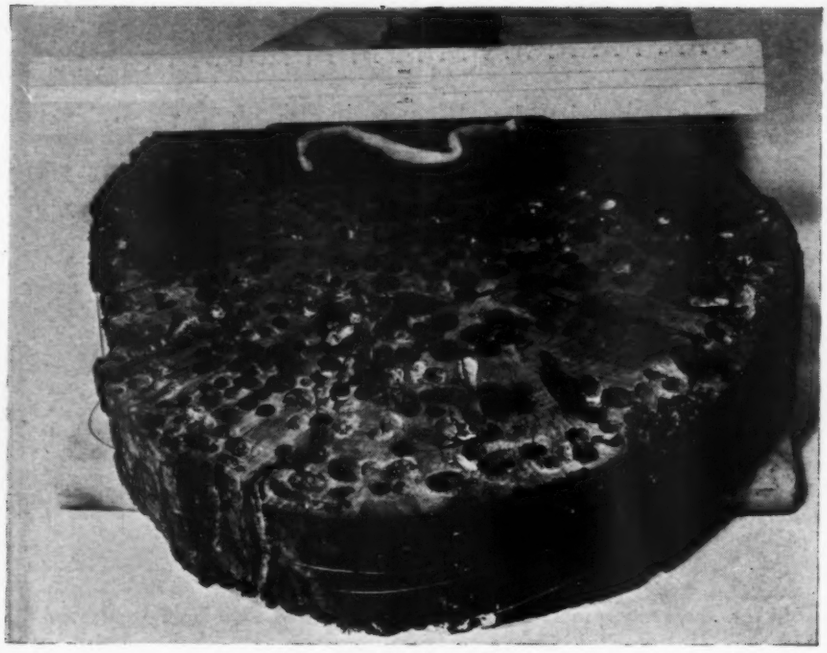
Loading eucalyptus logs on to a trailer from a loading ramp in the forests of New South Wales

throat sprays, and lozenges. The oil has a pleasant odour and is antiseptic, and it is also a useful spot and stain remover.

Some of the eucalyptus species are among the best honey plants in the world, both in the quality and the quantity of the honey produced; others—less good—may be useful for maintaining the swarms of bees by producing a flow of nectar and pollen at a time when the best honey species have ceased to flower.



The infloresence, fruit and leaves of one variety of eucalyptus



Infestation of a marine structure (timber of E. Pilularis*) by a teredine borer,* Bankia debenhamii

This is only a brief general résumé of a massive work about this interesting tree crop, which is shortly to be published by Leonard Hill [Books] Ltd. This monograph will describe its morphology, botany, methods of propagation and cultivation, forestry pests and diseases of the timber and the many uses of a tree, with so many varieties and strains, in a wealth of detail.

Letter to the Editor

Sir,—I have been interested to read Mr. Heseltine's article on Quelea birds in WORLD CROPS for June 1960, particularly as I have been closely connected with the study and control of Quelea in Tanganyika since 1953. I also attended the first C.C.T.A. meeting on these birds in Dakar in 1955.

I would like to comment on two points made in this article. First of all, the author states that the most efficient method of controlling roosting birds appears to be the Tanganyika flame-bomb method. Since 1958 that method has largely been superseded by aerial spraying with parathion, but he only mentions one rather unsuccessful attempt to use this method in the French Sudan. During 1959 we killed upwards of 80 million birds alone by aerial spraying and another 20 million by other methods. So far this season we have killed 50 million by aerial spraying. As he remarks, this method cannot be used for densely populated areas, but fortunately in Tanganyika *Quelea aethiopica* breeds in roosts largely in sparsely inhabited or uninhabited areas. This method has, however, been used safely even in settled farmlands where non-African farmers can be trusted not to enter sprayed areas until it is safe to do so. Careful note of the effect on other species of birds and mammals has been made, and there have been very few casualties reported.

Secondly, Mr. Heseltine stresses the need for an international control organisation. I question this. The distribution of Quelea is largely discontinuous, and there are well-defined regions where the three sub-species occur. At the first C.C.T.A. meeting we considered that co-operation within those regions was necessary where the annual movements of the birds crossed international boundaries. I still consider that such regionalisation is all that is required. It has been successfully started in French West Africa, while there is close co-operation and mutual support between Kenya and Tanganyika, the only East African territories which are seriously affected.

Frankly I cannot see how any overall international organisation could assist. As far as East Africa is concerned, I think we know sufficient about the biology and movements of the birds in our region. What we have to do is to increase the weight of our joint attack, which, thanks to a special grant from the United Kingdom Government, has been made possible from 1 July, 1960.

N. R. FUGGLES-COUCHMAN.
Assistant Commissioner for Agriculture,
Tanganyika.

The Wild Oat Problem

The presence of wild oats in cereal crops has been a major problem for at least 2,000 years.

WILD OATS has constituted the major unresolved weed problem in British agriculture and in the cereal areas of eastern England, in the past it was common to see fields of barley that were entirely dominated by this weed, which overtopped the barley crop and reduced the yield. It has been estimated that the crop loss, so caused, approaches £20 million in Britain each year.

There are two species found in Britain, *viz. Avena fatua* and *Avena ludovicinia*. The former, known as the spring wild oat, is by far the most common and this germinates mainly in the spring, though it will also germinate in the autumn, when winter frosts will usually control it. The latter, known as the winter wild oat, occurs mainly in South-Eastern England. This species germinates in one season only, between October and early April.

A natural incidence of many years' standing has been aggravated in the last two decades by intensive cereal production and by the elimination of many of the other competing broad-leaved weeds, using 2,4-D, MCPA and CMPP. The combine harvester, the sack, the boot, the tractor tread and other agents have played their part in spreading the weed from field to field. The problem is a serious one in wheat, oats and barley, sugar-beet and peas, and to a lesser degree in other crops.

Yield depressions of from 10-50%, varying with the degree of infestation, are caused by wild oats. The wild oat usually ripens and sheds seed before the crop in which it is growing, thus reinforcing the reservoir of seed in the soil. The seed can remain viable for many years, so that variations in ploughing depth can reinfest the surface layers of the soil. Cultivations to destroy germinating seeds and long grass leys have helped to ameliorate the situation, but there is still an urgent need for a really effective means of controlling this pest.

In Canada, where the total annual loss caused by this weed has been estimated to be U.S. $125 million, the problem has been investigated by the *Monsanto Chemical Co.* It was discovered that barley can be safely treated under the conditions prevailing there, for the control of wild oat, with a product called 'Avadex'.* Subsequently *Boots* instituted a trial programme in Britain, concentrating on spring barley. Two methods of investigation were used.

Heavy infestations of wild oats are associated with a reduction in the size of barley heads. Alternate heads in this picture are taken from untreated and treated sections respectively .

Controlled field trials

These trials were conducted within a radius of 30 miles of the Lenton Experimental Station, Nottinghamshire and were designed to investigate: 1. Rate of application. 2. Method of incorporation. 3. Effect of different types of soil. 4. Timing of drilling. 5. Confirmation of safety in use on all varieties of barley. 6. Persistence in soil.

User trials

Thirty-eight user trials were also carried out by farmers under supervision of the research and field staff in a variety of environmental and climatic conditions in the main wild oats areas from Yorkshire to Devonshire, and the application rate was at 3 to 4 pints per acre.

With a rate of application of 3 pints per acre, control of the pest has varied from 90-100% in wild oat populations varying from 10-300 plants per sq. yd. This was during 1960, when wild oat infestation was particularly severe.

Increases in yield due to the removal of wild oats were usual and in one field, with an infestation rate of 300 wild oat plants per sq. yd., a crop increase of 50% was recorded.

The formulation was applied to the bare ground with an ordinary sprayer and thoroughly mixed into the soil by subsequent cultivations. The barley is planted next day, although delay through bad weather or other reasons

* Avadex : 2,3-dichloroallyldiisopropylthiolcarbamate.

does not materially affect the issue. The new product is stated by the manufacturers to be non-toxic and it is also claimed that it does not build up in the soil nor remain as a residue in the crop.

Left:

A badly infested crop of Proctor barley. The wild oat stands out against the man's clothes. This is typical of the degree of infestation over the whole of the unsprayed section behind

Right:

Only a few feet away from the unsprayed section the wild oat has been virtually eradicated. The strength of the spray used was three pints to the acre

Grain Drying by the Small Farmer

GRAIN drying can now be done by the small farmer using the Demeter drier, a machine which has been developed over the past three years by *Olley Bros. & Reeder Ltd.*, to the design of Mr. Robertson Stewart, a consulting engineer with long experience of the problems of crop drying.

Grain, in common with other vegetable materials, has its own inherent rate of moisture removal, and sufficient time must be allowed for the moisture inside each grain to reach the surface before evaporation can take place. If drying is forced, the outer surfaces of the grain become overheated and the quality of the finished product is impaired. The new dryer was designed with this important principle in mind, and the drying time in relation to moisture extraction is carefully controlled.

The processing takes place in two distinct stages, and the grain is thoroughly mixed between each stage to ensure even drying and to allow time for the moisture distribution within each grain to become uniform. A reduction of 6% moisture—from 19 to 13%—is achieved at a throughput of one ton of grain per hour, with an out-put of 18 tons per day.

The wet grain is fed to the top of the first drying chamber and passes slowly downwards between perforated plates. Air, heated to the required temperature, is blown into a central chamber and forced outwards through the column of grain.

The flow of grain through the first stage is automatically controlled and passed into a metering chamber from which it is fed to the second drying chamber by means of an auger elevator. It is between these stages that it is allowed a resting period of about 15 minutes.

The new Demeter grain drier

The lower end of the second drying chamber is connected to the suction side of an 18-in. *Keith Blackman* blowing fan, driven by a 6-h.p. electric motor, cold air is drawn through, and the cold, dry grain is continuously discharged. Drying is continuous, so that the unit can be left running without attention until the intake pit or bin is empty.

In the cooling stage, the cooling air is warmed by the grain, and, after passing through, it is re-heated and mixed with the drying air, so that heat is conserved.

In one operating trial, 120 tons of grain were dried from roughly 19 to 13% moisture using only 140 gal. of fuel oil.

The dryer is a compact unit, 12 ft. to the top of the vertical drying chambers, covering a floor space measuring 7 ft. by 5 ft. 5 in. Constructed mainly of seasoned African hardwood and heavy galvanised sheeting, it weighs only 30 cwt. Installation is very simple, almost any foundation can be used, and the drier can be erected ready for operation in half a day.

Protection of Grain in Storage

J. P. BROOKE, B.SC.*

This article gives the results of trials carried out in Morocco with liquid and powder grain protectants, containing pyrethrins and piperonyl butoxide. It will be of interest to all who are concerned with the storage of tropical products, such as copra, cocoa, coffee and rice.

THE protection of stored grain from insect infestation is a major problem, especially in warm climates, and now that more and more grain is stored in bulk by co-operative movements, or at government storage centres in grain-growing countries, not only as insurance for lean years, but also for home consumption and for export, the number of places where conditions are suitable for rapid multiplication of grain-infesting insects is increasing. With this growth a demand has arisen for an economic and safe method of preventing insects entering the grain.

An immediate solution is to add to the grain an insecticide which will be harmless to the consumer, give residual protection to the grain and be competitive in cost with fumigation. Such protective treatment would prevent weight losses due to infestation, which occur even where grain is fumigated regularly. Treated with an efficient protectant, grain would remain uninfested until the end of the storage period and, depending on the properties of the insecticide used, protection may then continue whilst the grain is awaiting shipment in port silos and in ships' holds until processing.

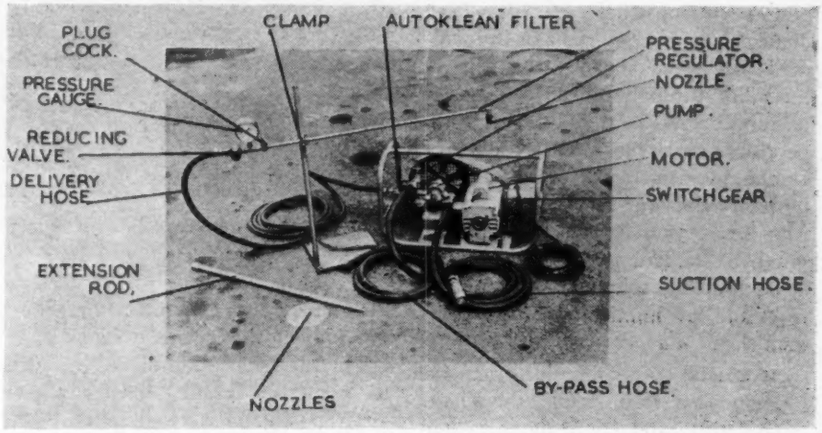


Fig. 1. *The spraying unit used for applying the liquid protectant to grain*

Small-scale trials

Grain protectants containing mixtures of pyrethrins and piperonyl butoxide have been studied and Goodwin-Bailey and Holborn[1] have produced evidence of useful protection in England. Subsequent research at the *Cooper Technical Bureau* has shown that, against *Calandra granaria* L. piperonyl butoxide will synergise pyrethrins from nine times when it is combined with pyrethrins in ratio 2.5 : 1 to 19 times when in the ratio 20 : 1. To obtain an economical grain protectant, trial products were formulated as powders and miscible oils containing pyrethrins : piperonyl butoxide in a 1 : 16 ratio.

Recently (1957-58) a small-scale trial was carried out in a farm granary in England, where small quantities of wheat were treated with either liquid or powder protectants containing pyrethrins : piperonyl butoxide to give a concentration in the grain of 1.7 : 27 p.p.m. pyrethrins : piperonyl butoxide w/w. One year's protection from infestation by *Calandra granaria* L., *Hofmannophila pseudospretella* Staint. and *Oryzaephilus surinamensis* L. was obtained with the liquid product and 10 months' protection with the powder protectant.

It became apparent, when these results were compared with the results of laboratory trials, that the total protective effect improved with the increase in size of the bulk treated. The rate of degradation of the insecticide is slower in large masses of grain and this is probably related to the reduced air circulation and temperature variation in such masses.

During the life of the protectant on the grain, the pyrethrins slowly degrade. As a result the proportion of piperonyl butoxide to pyrethrins increases and with it the factor of synergism† increases; thus the biological efficiency is maintained for long periods. The stability of pyrethrum insecticide depends upon formulation and the conditions under which it is used. For liquid protectants certain types of emulsifiable concentrates are much more effective than others and light and temperature are prime factors affecting the stability of a correctly formulated product when it is mixed with grain.

Large-scale trials

To determine the efficiency of these liquid and powder grain protectants under sub-tropical conditions large-scale trials were arranged in Morocco during 1957-59. Morocco was chosen for the trial because large quantities of grain are grown and marketing is well organised. Insect infestation of grain is a serious problem and frequent

* The author is indebted to Messrs. Cooper, McDougall and Robertson Ltd. for permission to publish this paper.

† Synergist: a non-insecticidal chemical which will increase the potency of an insecticide.

fumigation is the only form of control practised at present. The normal storage period is up to 6-10 months in both inland and coastal stores, while in years of good harvest this may be exceeded by several months.

At inland stores *Calandra oryzae* L., the rice weevil, *Calandra granaria* L., the grain weevil, and *Rhizopertha dominica* F. the lesser grain borer, are the primary pests encountered. *Oryzaephilus surinamensis* L., the saw-toothed grain beetle, and *Tribolium* spp., the flour beetles, are secondary pests occurring where grain has been damaged by primary pests or in handling. In these regions, the relative humidity throughout the summer is usually below 40%, while the temperature may rise to 110°F in the shade. In the autumn, temperature falls, the humidity rises and from October until May insect activity reaches a maximum. *Calandra oryzae* L., because of its ability to tolerate high temperatures and low humidity, is more common than *Calandra granaria* L.

At coastal stores, humidity remains continuously high, while the shade temperature rarely rises above 32°C at the height of summer, giving ideal conditions for the proliferation of insects throughout the year. The same species of insects are found as at inland stores, but because of the lower temperature and higher relative humidity *Calandra granaria* L. is more common than *Calandra oryzae* L. *Plodia interpunctella* Hbn., the Indian meal moth, is widespread and *Trogoderma granarium* Everts., the Khapra beetle, is established at a few inland stores. At present *Trogoderma granarium* Everts. does not appear to be of economic importance.

Materials, methods and results

Two protectants were used in the trials:

1. A powder containing 0.1% pyrethrins to 1.6% piperonyl butoxide in a specially blended organic-inorganic carrier. The rate of application was intended to give a concentration of 1.7 : 27 p.p.m. pyrethrins : piperonyl butoxide in the grain by weight.

2. A liquid containing 4% pyrethrins to 64% piperonyl butoxide by weight. This concentrate was diluted 1 vol. concentrate to 19 vol. of water and applied at 1 l. to 1,200 k. of grain, giving a final concentration in the grain of 1.7 : 27 p.p.m. pyrethrins : piperonyl butoxide by weight.

Fig. 2. *The sprayer can be sited in a variety of positions. Here it is over an open spiral conveyor*

For the application of the products to grain a vibrating feeder and a sprayer (Fig. 1) were designed. The sprayer could be sited in a variety of positions—in a falling column of grain, or over a band of grain on a conveyor belt, or open spiral conveyor (Fig. 2).

During the treatments temperature and humidity varied from a midday indoor maximum of 40°C 40% relative humidity at inland stores to 32°C 90% relative humidity at the coastal stores. The trials were arranged to coincide with the worst periods of infestation, *i.e.* autumn, winter and spring.

Using powder protectant

Treatment was carried out at six stores (Table 1) and the feeder was sited to deliver on to belts and into grain falls or conveyors. The treated grain was stored in a variety of conditions in old and modern silos, inside warehouses in bulk retained by bulk-

Table 1

Details of treatment with powder protectant

	Type of storage and tonnage			*Application rate, powder : wheat w/w*	*Estimated % loss of powder*	*Moisture content of wheat during treatment*	*Specific gravity, kg., per hectolitre*
	Silo	*Bags and bulk*	*Bags only*				
Fes Inland store A	180 (vertical)	—	—	1:600	Nil	<11%	—
Fes Inland store B	400 (vertical)	—	—	1:444	Nil	<11%	Untreated 80.4 Treated 80.0
		277	—	1:504	5%		
Meknes Inland store C	260 (vertical)	—	—	1:693	Nil	<11%	Untreated 82.4 Treated 81.0
		307	—	1:503	5%	<11%	
Mazagan Coastal store D	—	—	101 No dunnage	1:580	Nil	<14%	Untreated 79 Treated 79
Port Lyautey Coastal store E	—	—	100 Outdoors on dunnage	1:286	30%	<14%	—
Casablanca .. Coastal store F	120 (horizontal)	—	—	1:429	15%	<14%	—
		—	74 No dunnage	1:411	25%	<14%	—

heads of bags, or in bag-stacks both indoors and outdoors (Figs. 2 and 3). Only wheat from the 1957 harvest was treated. Bottoms of storage spaces and the tops of grain bulks were dusted with the protectant where possible. Only at one store was dunnage‡ employed for bagged grain. Where necessary, grain was cleaned before treatment.

When visual examination of the treated grain was made after six and nine to 10 months of storage, representative samples were drawn for assessment of infestation and grain damage and for biological assay.

Complete protection was obtained for nine to 10 months at all inland and coastal stores, where the grain was effectively treated and where it was stored indoors.

At inland store C, where 260 tons were stored in a single cell of a metal silo, large numbers of dead *Calandra* spp. and *Rhizopertha dominica* F. had accumulated on the surface of the treated grain. Slight heating was detected and an infestation was found centred about 6 feet below the surface. An estimated 95% of the insects on the surface were dead, although some live *Tribolium* spp. were found, few of this species being affected by the protectant. A bio-assay carried out on samples of the grain showed that some deterioration of the protectant might have occurred below the surface, although infestation is more likely to have commenced in a pocket of untreated grain which entered the silo during a blockage of the powder feeder. Many of the *Calandra* spp. taken in samples from this area were dead and most of those weevils which had moved away from the heat towards the surface had succumbed to the protectant in the surrounding grain.

During the treatment, infested grain from the previous year's harvest accidentally entered the silo. It is considered more likely, though, that the infestation derived from the numerous insects wandering about from one bin to another.

Slight grain damage was noticed in the infested portion of the grain.

At coastal store E the method of treatment was very unsatisfactory, because the cleaning plant was totally enclosed between the separator plates and the bagging point. The protectant had to be applied to an elevator boot between the sieves and the separator, so a high proportion of the powder was removed by the separator. The treated grain was stored outdoors in bags under sheeting and after six months' exposure a very heavy infestation of *Calandra granaria* L. was present, large numbers of these insects crawling over the outside bags when the tarpaulin was removed. The heat of the sun had created a high temperature beneath the tarpaulin cover, which degraded the protectant in the outer bags.

At coastal store D and inland stores A and B, no live insects were found after 10 months' exposure.

At coastal store F, all the grain was sold insect-free and in good condition after only five months of storage. Untreated grain in the warehouse was generally infested.

Results of bio-assay tests on grain samples taken from all stores showed that generally very little degradation of the protectant had occurred. Where bags formed bulkheads for bulk grain some deterioration of the protectant seemed to occur in the outer bags, but not in the bulk. Deterioration also took place at the bases of silos, but how much of this was due to inaccuracy of application and of sampling is not known.

Table 2
Details of treatment with liquid protectant

	Type of storage and tonnage		*Application rate, liquid:grain w/w*	*Moisture content of wheat during treatment*
	Silo	*Bulk*		
Fes	412		1:1,182	<11%
Inland store B		920	1:1,216	<11%
Meknes	300		1:1,200	<10.5%
Inland store C	300			
	300			
	300			

Using a liquid protectant

Application with the sprayer was simple and accurate, the error being ± 1.5%. At inland store B, where 900 tons of soft wheat were treated and stored in loose bulk in a warehouse, no signs of infestation were found in the grain after eight months' storage. Large numbers of dead insects, mostly *Calandra* spp. and *Oryzaephilus surinamensis* L., were found close to the pile of grain, while an adjacent bulk of untreated wheat was infested.

A further 412 tons of hard wheat

Fig. 3. *In Coastal Store E, the treated grain was stored outdoors and a very heavy infestation resulted*

‡ Dunnage: material used to place beneath a stack of bags, *e.g.* straw mats or pieces of light timber.

were treated and stored in one bin of a concrete silo. No live insects were found in samples taken from the top or bottom of the bin, also after eight months' storage. Other untreated grain in the silo had been fumigated twice in the previous eight months. Numerous insects were found wandering about the buildings and in crevices.

At inland store C, 1,200 tons of hard wheat were treated and stored in four metal silo bins, but unfortunately the contents of two of the bins were sold after six months' storage. No infestation was recorded at that time. The remaining bins were examined after eight months' storage and no signs of infestation were found. Again, an endemic infestation was present throughout the buildings.

Discussion

Treatment with the powder protectant gave a minimum of nine months' protection where the grain was effectively treated and where it was stored indoors.

The liquid protectant gave up to eight months' protection, when the trial was terminated owing to sale of the treated grain. It is likely that a longer period of protection would be obtained if necessary in view of the excellent results of bio-assay of samples taken, when freshly treated, and after storage. Where the powder failed to protect at coastal store E, indications were that outdoor storage and improper application were responsible.

The powder protectant is unpleasant to handle mechanically, but for the small user can be more easily applied by hand than the liquid protectant. In bulk quantities, the liquid protectant can be applied more accurately and is not unpleasant to use. The addition of dust to wheat (Table 1) may adversely affect the specific gravity and where grading is based upon specific gravity, this may be of importance if large quantities of grain are treated.

In Morocco most grain from the farm is insect-free when brought into store within a short time of harvest and little infestation arises from *Calandra oryzae* L. in the pre-harvest crop. All primary infestations can be said to occur in the warehouses and silos of the co-operatives and merchants, where virtually all grain passing through trade channels is stored.

It has been suggested that *Calandra oryzae* L., and especially *Calandra granaria* L., will not breed freely in grain with a moisture content as low as 10-11%. When the powder treatment was carried out at store B and store C during July-August 1957, the moisture content of the wheat was 9-10% and it was known that at that time infestation by *Calandra* spp. is unimportant at inland stores until late autumn.

By February the average moisture content had risen to 13%, falling to 10-12% by May-June. Birch,[2] using a small strain of *Calandra oryzea* L., found that the lowest moisture content of wheat at which this species would oviposit was 10%, while *Rhizopertha dominica* F. laid eggs in wheat of 8% moisture content. He mentioned, however,[3] that *Calandra oryzae* L. can multiply rapidly in wheat of 11% moisture content only at temperatures below 23°C.

It is clear, therefore, that conditions at inland stores are unsuitable for insect development throughout the summer. It is known that during summer at these inland summer stores, breeding by *Calandra* spp. is unusual, but with the increase in the moisture content of wheat in late autumn, coupled with a fall in temperature, *Calandra oryzae* L., and to a lesser degree *Calandra granaria* L., breed freely in wheat. *Rhizopertha dominica* F. thrives throughout the year.

As conditions vary so much it can be argued that grain at inland stores is in a suitable condition for insect development during only a short period of the storage year. Nevertheless, infestation will always begin at inland stores in the autumn and increase with the winter, reaching a peak in the early spring.

In some years *Rhizopertha dominica* F. is sufficiently encouraged by climatic conditions to become a major problem. It appears, however, that this pest is adequately controlled by the two types of protectant used. Pyrethrins and piperonyl butoxide will not control *Tribolium* spp. at the concentrations used, although these insects are of little economic importance except where a primary infestation has been allowed to occur. The insecticide is, however, strongly repellent to this species. Treatment of comparatively insect-free and undamaged wheat should render fumigation unnecessary in a normal storage season of six to 10 months.

As with all products used in pest control, a prime consideration is efficiency in relation to cost. In these trials it was found that the liquid protectant compared favourably on a single treatment basis with fumigants in common use. As fumigations were carried out at frequent intervals, the protectant would lead to a considerable saving where large quantities of grain are treated.

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Tree Seeds and Forest Genetics

The Forestry Commission hopes to arrange at least two courses in Scotland during 1961 on the subject of tree seed collection. These will be for their own staff and representatives of private estates, including members of the Scottish Tree Seed Association. Each will last for two or three days.

The latest equipment for cone collection will be demonstrated and instruction given in its use; this equipment will include the tree 'bicycle' and the climbing net.

A course dealing with the broader aspects of forest genetics will be held next year at the Commission's educational centre in the New Forest, Hampshire. This will be for forestry consultants, landowners, nurserymen and forest officers, with the object of encouraging the production and use of good quality seed. A number of the places on this course will be allocated to representatives of overseas countries as part of the training advocated by FAO.

Water for Desert Lands

A good underground water supply has been found in a semi-arid area of Victoria, giving rise to hope that it may eventually be developed for irrigation farming. The area is the Little Desert, between the rich wheat lands of the Wimmera District and the South Australian border.

Progress in Weed Control

IN opening the Fifth Weed Control Conference, organised by the British Weed Control Council, Dr. H. G. Sanders, the President, modestly declared that he was one of those who strive, with little success, to keep in some sort of touch with the astonishing advances in the use of herbicides.

In farming, he said, developments are determined by the sordid realities of economics. As things are today, the British farmer has to keep his unit costs down even to maintain his present share in the home market. Herbicides have to pass many tests in regard to safety, selectivity and effectiveness, but in the future, he predicted, they will be judged more and more by their cost in relation to the job they do.

The accumulation of knowledge is proceeding at such a pace that it is becoming ever more difficult for the farmer to keep up. It is, therefore, being argued that he must specialise, so that he can really be master of one type of production. Some move in this direction, he thought, was inevitable and it seemed to him that the best solution was for the farmer to delegate some of his responsibilities by obtaining specialist services in the field of chemical weed control.

Prof. H. G. Sanders, President of the British Weed Control Conference

He referred specially to the problem of the wild oat, a menace which is becoming greater every year. Old-fashioned good farming, he said, used to keep this weed in reasonable check, but it was little use advocating a return to those methods. There were, he added, herbicides which, with some modification of cropping, will give a practical means of control, and he spoke of rumours about new chemicals which will deal with the wild oat in cereal crops, even, he had gathered, in some varieties of oats (see page 25).

But he forecast that the wild oat's cunning tricks of variable and possibly prolonged delay in germination was going to cause very real trouble. The treatment would have to go on without intermission for 10 years at the very least. Even then there might be one laggard germinator still capable of starting the curse again.

As usual, the proceedings of the Conference are to be published by the Council; we shall be publishing a number of short abstracts of selected papers and in this issue these will concern weed control in two root crops —sugar-beet and potatoes.

1. *Sugar-beet and Potatoes*

Field Trials with Endothal/Propham for the Control of Seedling Weeds in Sugar-beet *by B. H. Bagnall, J. J. B. Caldicott and D. J. Minter* (*Murphy Chemical Co. Ltd.*)

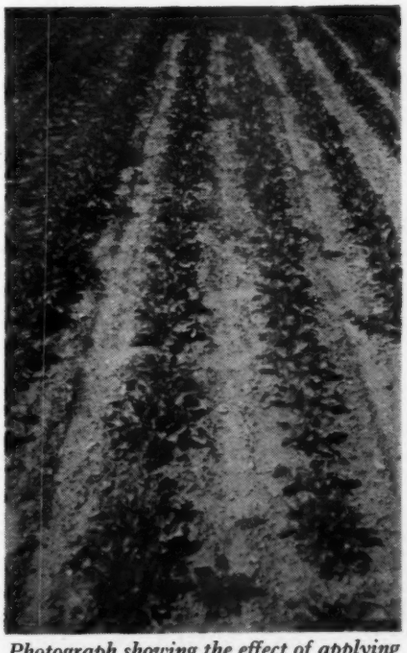
When used alone in Britain, endothal has insufficient selectivity against a full range of weeds. It has already been shown that a wider range of weeds can be controlled by a mixture of endothal and propham, the latter controlling many of the weeds which are only partially checked by endothal.

After consultation with Dr. Murant, it was decided that a ratio of four parts endothal to 3 parts propham was likely to prove most useful for the trials. This ratio was chosen, taking into account both the efficiency against a full range of likely weeds and the safety level of both herbicides to the beet crop. In addition, three rates of use of the mixture of endothal-propham were selected to allow for variations in soil type.

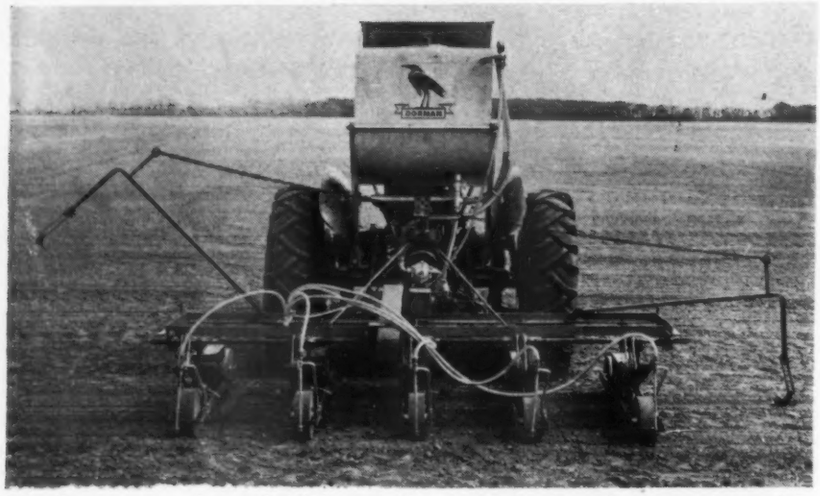
The results of the trials showed that the selected ratio appeared satisfactory both for weed control and safety to the crop. Unless a method can be developed whereby the weedkiller can be mechanically incorporated into the soil, it is evident that adequate rainfall following spraying is necessary for satisfactory weed control.

Post-emergence Nitrate of Soda Sprays for Combined Nitrogenous Fertilisation and Weed Control in Sugar-beet *by A. Coombe and J. Dundas* (*Chilean Nitrate Agricultural Service*)

The apparent paradox of the use of a nitrogenous fertiliser as a herbicide is explained by the fact that the sodium in the nitrate of soda is beneficial to sugar-beet, but is injurious to most



Photograph showing the effect of applying 4½ lb. endothal and 4½ lb. propham. The weedy control is at the top of the picture



The Dorman spraying and drilling machines used in the endothal-propham trials. The out-riggers are pointers for making a guide line

annual weeds when applied as a solution to their leaves and can kill them, or at least severely check their growth.

Effective weed control is obtainable in sugar-beet fields by post-emergence spraying with 2½-3 cwt. nitrate of soda in 65-100 gal. water plus spreader per acre. The spray is most effective if applied when the beets have not more than two true leaves and the weeds are not beyond the cotyledon or small rosette stage, and if preceded by good growing weather and followed by at least 24 hours' dry warm weather. Control of 60% or more is obtainable and the destruction and checking of weed growth make possible a saving of labour in hoeing and the postponement of hoeing and singling.

There is no financial risk in the use of the spray because it acts as a nitrogenous fertiliser, giving a yield equal to that obtained with a solid top-dressing. The amount of nitrogen the spray contains should naturally be taken into consideration in determining the nitrogen fertilisation of the crop.

Pre-emergence Weed Control in Sugar-beet: Experiments in 1959 and 1960 *by A. F. Murant and G. W. Cussans* (*Norfolk Agricultural Station*)

In seven replicated trials in 1959 confirmation of earlier encouraging results was obtained with pre-emergence applications of endothal and mixtures of endothal and propham in sugar-beet. Mixtures of cyclo-octyl dimethylurea (OMU) and butinol chlorophenyl carbamate (BIPC) appeared less reliable. The effectiveness of all treatments appeared to depend on the clay and organic matter contents of the soils.

Tests on 28 sites in 1960 gave some confirmation of the influence of soil type on the action of endothal/propham, but there was also a clear effect of rainfall after spraying. OMU/BIPC gave better results than in 1959, but some crop damage occurred.

It is clear from the results that factors other than soil type have too great an effect on the behaviour of endothal/propham mixtures for a suitable dose to be reliably predicted for any particular conditions. However, a mixture of 3 lb. endothal and 2.25 lb. propham per acre appear to be safe on all sites and would give fairly good weed control on soils low in clay andor/organic matter, provided that rainfall after spraying was not exceptionally low.

In other experiments the endothal/propham mixtures appeared to be safe when applied and incorporated into the soil before sowing.

The Use of Herbicidal Sprays on the Potato Crop *by I. M. Robertson* (*N.I.A.E. Scottish Station*)

A considerable amount of working is normally necessary on potato land in the early part of the season to obtain a satisfactory tilth and control weeds. Thus, during the growing season it is not uncommon to give upwards of 10 passes of a variety of tractor-drawn implements, such as harrows, cultivators and drill ploughs. Whilst the use of these implements may reduce the clod size in the upper surface, observations have shown that the passage of tractor wheels can produce consolidation of the soil and increase the number of clods, particularly in the sub-surface layer.

Many of these clods are not subsequently broken down. This condition persists right through to the harvest and this makes more difficult the subsequent separation of tubers on a potato harvester. A technique has been evolved which reduces to a minimum the number of tractor operations. A fine tilth is produced before planting and inter-row cultivation eliminated by replacing mechanical with chemical methods of weed control.

An area of sugar-beet in Buckinghamshire, England. Left: *sprayed with nitrate of soda.* Right: *unsprayed area, choked with weeds*

In three seasons of widely differing climatic conditions a mixture of DNBP and TCA has given a uniformly high standard of weed control. With an early variety more rapid tuber formation and a slightly increased yield have been obtained; with a late variety yields have remained unaffected. In all cases the clod content has been reduced. Tasting trials have failed to establish taint from the herbicide.

A mixture of DNBP and TCA has given a high standard of weed control. The unsprayed section is in the background

Trials of Chemical Weedkillers in Potatoes *by C. A. Wood, J. P. Sutherland and R. J. Stephens (Scottish Horticultural Research Institute)*

Potatoes require intensive working for weed control until the haulm forms a continuous cover. In some soils cultivations may have beneficial effects in addition to the control of weeds, although excessive cultivations can reduce yields and probably retard maturity. Tractor operations on some soils, especially in wet conditions, produce clods which remain until lifting and increase hand work on mechanical harvesters. Chemical weedkillers have successfully been used in North America, where several states issue recommendations.

An account is given of herbicide trials in potatoes at Invergowrie in 1959 and 1960. Dinoseb amine, applied at 6 lb. per acre to the ridged drills shortly before the emergence of the crop successfully replaced cultivations as a means of weed control and caused no reduction in crop yield in 1959. Yields for 1960 have still to be recorded. Simazine and other residual herbicides of low solubility gave poor results, probably because their application was followed by dry weather conditions, but some of the less insoluble triazines showed promise.

Preliminary tests on cooked tubers suggested that slight tainting might have been caused by certain of the treatments. Tubers from all treatments sprouted normally in the spring after harvest.

The Oxford precision sprayer devised by members of the Weed Research Organisation was used for the weed control trials in sugar-beet carried out at the Norfolk Agricultural Station. Note the T-shaped lance

For code interpretation see World Crops, 1960, **12**, 446.

Training Centre in Middle East

Plans have been approved by the British Government and other members of the Central Treaty Organisation—Iran, Turkey and Pakistan—for the opening of a new Agricultural Machinery and Soil Conservation Training Centre at Karaj in Iran early next year.

From the start, the Agricultural Engineers' Association, in conjunction with the National Institute of Agricultural Engineering, has been consulted and has assisted in the appointment of instructors. The British agricultural engineering industry has given advice on the tractors and machinery required by the new centre and will provide them free and maintain them.

The four countries will share the financial cost, the Government of Iran will provide the buildings and the British Foreign Office has appointed Mr. A. C. Maher, who was until recently Chief Agronomist, Overseas Food Corporation, Tanganyika, to be the first Director.

The centre will begin by providing training for 25 students at a time, to be drawn from Iran, Turkey and Pakistan.

NOTE FOR CONTRIBUTORS AND AUTHORS

The editor welcomes authoritative articles and news items on agricultural machinery and agricultural methods, agricultural crops and new developments.

A short synopsis should preferably be included to assist the editor and the manuscript itself should be typed in double spacing with plenty of margin and on one side of paper only.

It should bear the name and address of the author and be accompanied by sharp photographs or line drawings with suitable captions.

World News

South-East Asia

Mekong River Development

A survey has been completed to provide information for hydrological studies in the first stage of a project to harness the waters of the Mekong river for power, irrigation and flood control. 1,800 miles of photography and ground control, with height data supplied by Airborne Profile Recorder, was carried out by the Hunting Survey Corporation, of Toronto.

Hungary

Farm Output Rises

Gross agricultural output in Hungary last year was 41% higher than in 1959, according to the 1960 Hungarian Statistical Pocket Book, published in Budapest. By 31 March, 1960, 80% of all cultivated land and 74% of all arable land were either State or co-operative farms.

Afghanistan

Grape Vine Disease

A campaign in Afghanistan to combat a grape vine disease, known as powdery mildew, has reduced losses, on average, from 50% to 3% in one year and has increased the value of the grape harvest by at least U.S. $1 million, according to a recent FAO report.

The present annual production amounts to some 20,000 tons of grapes, of which 11,000 tons are exported, mainly in the form of raisins, to India and Pakistan.

New Zealand

Aerial Farming

During the year 1959–60, nearly 4 million acres were top-dressed from the air in New Zealand, an increase of nearly 500,000 on the previous year. The number of acres sown with seed decreased by 26,000 to 86,000, while the aerial spraying of crops and noxious weeds with poisons and insecticides increased by 33% to 1½ million gal.

Australia

Seed Improvement Methods

Bencubbin wheat (above), which grows successfully in several Australian states. Part of Australia's contribution to the U.N. Food and Agriculture Organisation's World Seed Campaign is the provision of a course in seed improvement for overseas experts. Trainees from Burma, Ceylon, India, Iraq, the Philippines, Thailand and Vietnam are attending the course.

Malaya

Increasing Yields of Rice

Within five years the Federation of Malaya will be self-sufficient in rice, according to the Malayan Minister of Agriculture. During the 1959-60 season, Malaya produced a record crop of paddy, totalling 887,600 tons, equivalent to 559,200 tons of cleaned rice, about 70% of Malaya's total consumption.

It is expected that about 40,000 tons of paddy could be obtained by improved husbandry; field manuring is expected to increase total production by 11% and the Minister believes that a further increase of 10% is to be obtained by using selected varieties of seed.

Kenya

Tea Smallholdings

Kenya has vast areas of land suitable for tea cultivation and the Colony has imaginative schemes for the immediate development of African tea-growing involving 9,000 acres in a period of five years, according to the Minister for Commerce and Industry, Dr. J. G. Kiano, speaking at the dinner of the East Africa Tea Trade Association in Nairobi recently.

'We have already proved that the smallholder, with careful organisation and guidance, can produce good quality teas', he said. 'There is excellent co-operation between the African growers of tea and the established tea factories'.

New Publications

Importance of Wheat

Progressive Wheat Production. Centre d'Etude de l'Azote, Geneva, 1960. Pp. 338. Price not stated.

This is the fourth superb piece of book production from the Organisation of European Nitrogen Producers, which was founded in 1953. It is a sad thought that the production of books of this kind, with innumerable illustrations, many of them in colour, and a long, expert and magnificently presented text, are nowadays only within the resources of governments and international organisations.

The book is in two parts: the first contains authoritative monographs on wheat economics (F. C. Schlomer, FAO), on the botany and breeding of wheat (Dr. F. Wienhues, Max Planck Institut), on wheat cultivation (Prof. L. M. Kopetz, Germany) and on wheat nutrition and fertilisation (Y. Coic, France); the second consists of a larger number of articles, each dealing with wheat growing and any special features in the main producing countries of the world.

For many the opening monograph—on the social and economic importance of wheat—will provide the most notable contribution, for it presents an up-to-date view. It states that the present world position is one of dynamic equilibrium. As highly developed countries expand, their *per capita* demand for wheat falls; as under-developed countries raise their living standards, their demand for wheat rises. But from the global point of view, the conclusion finally reached is right—restriction of wheat production is not the correct solution to present and changing balances. The solution is improved wheat growing, so that productivity is raised and the price of wheat is lowered.

Linguistically the book is a polyglot. Prof. Kopetz's monograph is in German, M. Coic's is in French and these are followed by short summaries in English. On the other hand, Mr. Schlomer's and Dr. Wienhues's monographs are in English and they are not followed by summaries in French or in German. In Part 2 the articles on wheat in France and in North Africa are in French, but they are not followed by English summaries. There is clearly a certain degree of illogicality in this.

This brief review can simply applaud a high achievement in writing and book production. Some of the colour printing is superb.

It can reasonably be doubted whether so much factual and technical information about wheat has ever before been amassed between the covers of a single volume. It represents a great contribution on a subject of world importance that remains basic however many H-bombs are accumulated or space satellites put in orbit.

D. P. HOPKINS

Technical Books

308 Euston Road

London, N.W.1

(Tel: EUSton 5911)

as retail booksellers will be pleased to supply any books reviewed in this periodical, and will give immediate attention to any requirements you may have for other works

(Trade not supplied)

Economics and Agriculture

By Anne Martin. Pp. 149. Routledge and Kegan Paul, London, 1958. Price 21s.

This small volume introduces the reader to the study of agricultural economics. Anne Martin writes on the assumption that the reader possesses no previous knowledge of the subject and therefore explains analytical methods currently employed.

The avowed intention of the book is to stimulate interest in world-wide problems. One senses that the author considers that scientists in all branches of agriculture should possess some knowledge of economics. It is equally true that the agricultural economist should understand something of agriculture and of the practical problems that beset the agronomist.

The author is at pains to make a distinction between economics and technology, for she states that the one important function of the former is to point out that the ideals of technical efficiency and of economic efficiency are often incompatible. However, she refutes the charge that economists are engaged only in constructing internally consistent logical systems, without reference to reality.

The basic concepts of agricultural economics are contained in the first six chapters of this book and deal with such subjects as demand and supply, costs, forms of competition, economic rents and profits, and economic efficiency. These subjects are concisely treated and explained by reference to the work of authorities throughout the world. A useful list of books suggested to amplify knowledge is appended to each chapter.

The concluding three chapters are concerned with political economy—the reasons for the methods of government intervention in agriculture, including various systems of land tenure. If the reader considers the first part of the book a trifle 'dry', persistence in mastering these basic principles will be amply rewarded by appreciation of the final chapters, which are full of interesting information and refreshing opinions.

'The chief methods by which governments can help to raise the physical productivity of labour in agriculture are by assisting the education of the rural community . . . subsidising, or refraining from taxing, the resources of agricultural production; insisting that entrants to farming shall reach a certain level of professional competence; reforming land tenure; and carrying out or subsidising agricultural research'. One notes the author's emphasis on the need for education throughout this section of the book.

The provocative subject of land tenure is treated with great fairness to the various schools of thought. The author considers it difficult enough to generalise safely about the causes of different forms of land tenure, but far harder to generalise about their results, for examples may be found of the most highly productive use of land under what would seem the most unpromising tenure arrangements, and of bad use under what appears to be ideal conditions of tenure.

She concludes that no one system can be the best for all conditions, though it may prove difficult to maintain any system of land tenure that is thoroughly ill suited to a country's economic and demographic situation.

This moderately priced book gives a signally lucid explanation of the fundamentals of agricultural economics and is confidently recommended.

D. H. GRIST

Australian Agriculture

The Australian Environment, 3rd edition, revised, 1960. Pp. 151. Prepared by the Commonwealth Scientific and Industrial Research Organisation, published by the Melbourne University Press. Agents in Britain, Cambridge University Press. Price 30*s*.

This work was originally prepared for a conference, held in Australia in 1947, on plant and animal nutrition in relation to soil and climatic factors. Its aim was to provide delegates with a history of and information on the present stage of development of Australian agriculture.

It deals with a continent, very old in geological time, but very young in terms of land settlement. The first three chapters describe the geology, geography, climate and soils of Australia, and, in doing so, the problems of low fertility and the hazards of low rainfall are considered. Then follows the thrilling story of the development of agriculture.

The first stage, extending from 1788 to 1820, was one of slow progress and inefficient methods, with an ever-present fear of famine until 1810, when Tasmania began to export wheat. Then came the wool phase, from 1820 to 1852, and soon a thriving export trade was established. The gold rush followed, lasting from 1852 till 1880; this temporarily upset the pastoral industry, but raised the population from under half a million in 1850 to 2¼ million in 1880. Railways and roads followed, whilst a rapid influx of new immigrants brought a vigour of thought. Primary industries and irrigation were considered, and farm machinery was imported.

The next 50 years was a period of rapid agricultural expansion until the economic depression, a world-wide catastrophe, arrived in 1929. Conditions improved again during the late 'thirties, only to be upset by the war. However, during these ups and downs, the use of farm machinery was always on the increase, with the production of basic commodities like coal, steel, timber and cement.

No doubt other problems lie ahead. Most of the population lives in the cities and, whatever unemployment may come, there is unlikely to be a back-to-the-land or small farmers movement, under the conditions of farming, imposed by Australian climates and soils, which demand large-scale agriculture.

Other subjects treated include the vital problems of water and irrigation and a description of the natural vegetation of Australia, all subjects of fundamental interest.

The whole book makes an absorbing story, and fills one with admiration for this brave and resourceful people, now ten million strong, who are making a success under conditions which are unique in every way.

It is beautifully produced, well illustrated and freely supplied with maps and diagrams.

C. R. HARLER

Cotton in India

By B. L. Sethi and others. Vol. I—pp. 479. Illus. Vol. II—pp. 339. Illus. Indian Council of Agricultural Research, New Delhi, 1960. Price *Rs.* 30.00 each; 45*s*. and $6.50.

This four-volumed treatise is designed to provide comprehensive, up-to-date and authoritative information on all aspects of cotton growing, marketing and technology. Volume I comprises chapters on the history of cotton; climate and soils; taxonomy; morphology; breeding and cytology, while Volume II deals with physiology; agronomy; seed diseases; insect pests; seed multiplication and distribution of cotton. The Third and Fourth Volumes are to be published shortly.

Efficient Farming

Work Simplification in Agriculture. By D. W. Paterson. Pp. 82. Illus. Land Books, London, 1960. Price 21*s*.

At the present time work study to increase all-round efficiency and productivity on the farm is being much discussed in agricultural circles. This book explains what work study is all about and how it can be applied practically to cut operation time and, therefore, costs.

Work study has brought great benefits to many industries, and there is no reason why agriculture in any part of the world should not take advantage of every increase in efficiency it can make possible to improve and simplify each and every job of work on the farm.

Written in plain language with many explanatory diagrams (serious) and line drawings (humorous), the book makes for easy reading by the experienced farmer and his newest apprentice; the time so spent will be well invested.

F. C. COOKE

U.K. Ministry of Agriculture

Sugar Beet Diseases. Bulletin No. 142. Pp. 55. Illus. Price 7*s*. 6*d*.

Farm Buildings Pocketbook. Pp. 38. Price 2*s*.

Agriculture and Food. Sectional List No. 1. Pp. 36. Price not stated.

Experimental Husbandry Farms and Horticulture Stations. Report for 1960. Pp. 35. Illus. Price not stated.

Sugar Beet Cultivation. Bulletin No. 153. Pp. 114. Illus. Price 8*s*.

Mushroom Growing. Bulletin No. 34. Pp. 66. Illus. Price 6*s*.

These publications are obtainable from H.M. Stationery Office, York House, Kingsway, London, W.C.2.

Annual Reports

Wye College. Report of the Department of Hop Research, 1959. Obtainable from Wye College, nr. Ashford, Kent. Price 6*s*.

The Grassland Research Institute. Report for 1958–59. Obtainable from the Institute, Hurley, nr. Maidenhead, Berkshire, England. Price 7*s*. 6*d*.

Empire Cotton Growing Corporation. Report for 1960. Obtainable from 12 Chantrey House, Eccleston Street, London, S.W.1. Price not stated.

United Planters' Association of Southern India. Report for 1959–60. Obtainable from U.P.A.S.I., Glenview, Coonor, Nilgiris. Price not stated.

The Rubber Research Institute of Ceylon. Report for 1959. Obtainable from R.R.I. of Ceylon, Dartonfield, Agalawatta. Price not stated.

Still Smithfield Grows . . .
. . . and still it is not large enough

IT is a sign of changing times that the Smithfield Show, which was first staged in a livery stable in Smithfield in North London in 1798—over 160 years ago—has had to be renamed. From now on it will be known as the Royal Smithfield Show and Agricultural Machinery Exhibition. Unfortunately, for the first time since its inception, there were no live animals on show because of the danger of spreading foot-and-mouth disease, and so the exhibition of the 1,300 cattle, sheep and pigs which were entered for the show had to be abandoned. The carcass competitions, however, were held as usual.

The Smithfield Exhibition this year was jointly presented by the Smithfield Club, the Agricultural Engineers' Association and the Society of Motor Manufacturers and Traders, under the presidency of the Earl of Eldon, K.C.V.O. The Agricultural Machinery Exhibition was divided into sections for tractors; implements and farm machinery; agricultural and horticultural supplies and services; improved trade machines and equipment; periodicals, publications and associations serving agriculture and horticulture.

The vast covered area of 6½ acres at Earls Court was still quite inadequate to house the enormous display of machinery and equipment and the waiting list of exhibitors continues to grow, in spite of the fact that a larger area was allotted to the exhibition this year.

It all reflected the high optimism of the industries concerned, particularly in Britain. British engineers have made farming in Britain the most highly mechanised and the most efficient in the world and as a result Britain sells more tractors abroad than do her chief rivals—America and Germany—combined.

On the agricultural engineering side nearly 70 manufacturers, large and small, were giving many new products a first public showing. This was especially heartening when one remembered that the home sales of farm machinery are lower than they were last year.

Whatever the situation at home, Britain can boast a fine achievement on the export side, for the total exports in 1960 were again a record. The increase in tractor exports was 33½% and of implements 13·3% over the 1959 figures; and at the moment shipments of new machinery, tractors, tractor parts and implements are running at an annual rate in excess of £130 million.

It is a horrifying thought that two-thirds of the world's population live in countries where hunger and malnutrition are the common lot. Through the Agricultural Engineers' Association a fund to technical knowledge has been offered, freely and without

Allis-Chalmers introduced their ED-40 tractor at the show this year. This new tractor is equipped with a high and low range transmission giving eight forward and two reverse speeds

The Fordson 'Super Major' being used for subsoiling. This new tractor supersedes the Fordson 'Power Major'

reservation, to FAO in support of the Freedom-from-Hunger Campaign.

At this year's Royal Smithfield Show meetings took place between U.N. officials and leaders of the agricultural industries to discuss in what way they could help needy countries to overcome their difficulties. Mr. A. D. Faunce, chief of the Agricultural Engineering Branch of FAO, was among those taking part in these important discussions.

It is only possible in the following pages to give very brief details of some of the exhibits owing to limitations of space.

The introduction of a new tractor is always an important event—important not only to the farming community, but also to the manufacturers of ancillary equipment to be used with the machine. The attractive new E.D.40 tractor presented by *Allis-Chalmers (G.B.) Ltd.* is powered by a 4-cylinder diesel engine of 37 b.h.p. and has no less than eight forward and two reverse speeds. Its 3-point attachment can be used for either cat. 1 or cat. 2 linkages; a weight-transfer system has been incorporated and selective depth control is also included, while its high clearance permits the fitting of mid-mounted implements.

The centre-piece on the stand of *Bomfords Bros. Ltd.* was, of course, their new anti-choke reversible plough, which we first saw at the Royal Show and described in our October issue (see page 397). The safety overload problem through the plough hitting roots or concealed rock has been solved in an unusual way—they have hinged each share-carrying arm so that only the share which fouls the object is affected and not the shear pin of the whole plough. This company were also showing the 'Warwick' hedge-maker for attachment to the *International Harvester* B.275 tractor, a subsoiling attachment and a 2-furrow clay plough.

Bristol Metal Components Ltd. were showing the well-known 'Sta-Dri' tractor cabs as fitted to the *Fordson* 'Super Major' and the improved 'Dexta', the *Ferguson* '35', the *Nuffield* '3' and the *International Harvester* B.275. The special features of these sturdy cabs that we noted were the removable glass-fibre roof, the removable doors, the sliding side windows fitted with safety glass and the centre-divided backcloth, the unit giving all-round visibility, ample room and adequate ventilation.

The 'Hurricane' motorised knapsack powered mist blower by Cooper Pegler is easily carried over difficult terrain

Cooper, Pegler & Co. Ltd. claimed to have a machine for every crop and for every problem of pest control. They were showing their full range of spraying, dusting and soil injection equipment, the outputs of the machines shown ranging from 3-525 gal./hour and operating at pressures from 20-570 lb./sq. in. For the smallholder the company offered the 'Plafog', a small ½-gal. hand sprayer with a robust plastic spray container; the 'Hawk', a water-bottle pneumatic sprayer of 1 gal. capacity; and the 'Falcon', a lightweight knapsack and lance sprayer of 2 gal. capacity. They also showed their new 'T.G.D.' twin-diaphragm pump which delivers up to 9 gal./min. at pressures of 425 lb./sq. in. This new spray pump can be mounted and operated from the p.t.-o. of a tractor or carried on a separate chassis and operated by a small 4-stroke petrol engine.

The debut of the *Fordson* 'Super Major' at this year's Show certainly drew the crowds, for it had new features which together improve the work output without any change in h.p. or increase in fuel consumption over that of the 52-h.p. 'Power Major' that it now supersedes. It has 'Qualitrol', which gives effective depth control in spite of surface irregularities without loss of wheel grip and the necessity for changing gears; it also has 'Position Control', which automatically maintains an implement in its correct position, relative to the tractor, irrespective of changes in soil resistance. These two features together produce a transfer of weight from the implement to the tractor, so increasing rear wheel adhesion and giving better performance. There is a pedal-operated differential lock, which is a device used to correct single wheelspin by locking both rear wheels together temporarily. Other new features are the recessed headlamps and a deep cushioned seat pan and a back-rest, which gives greater driver comfort and makes it possible to work longer. The new disk brakes are effective even after the tractor has been hosed with water under pressure, as the ingress of water and dust is practically impossible. This factor of safety is particularly important in tropical conditions. The 'Dexta', with a new look, incorporates some new features also.

The 'Traction Sure-Grip' rear tractor tyre was naturally given pride of place on the stand of the *Goodyear Tyre & Rubber Co. (G.B.) Ltd.*, for

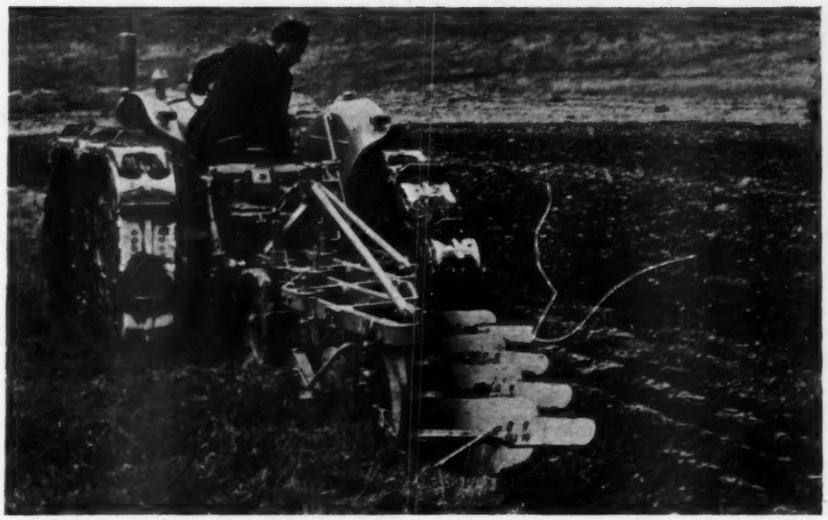
The 26-in. self-propelled Hayter scythe is suitable for rough and fine cutting. The wheeled version shown here is designed for difficult or steep country

this was the tyre used by the world champion ploughman for the last six years. Its open-centre tread and massive straight-bar lugs ensure a deeper bite and a firmer hold on the soil, so ensuring maximum traction at the point where pressure is applied. Other types of tyre, including a special row-crop tyre, were also shown, together with two of their range of hoses.

The *Hayter* '6/14' p.t.-o.-operated trailing grass cutter is so constructed that it will closely follow the contours of the ground when making its 6-ft. cut and the cutting height can be adjusted up to 6 in. In addition, this machine can be fitted with two flexible extensions to increase the cutting width to 10 ft. (one) or 14 ft. (two) as required. They were also showing the new 'Spring-matic' extensions, which permit cutting right up to and around tree bases without damage to the machine (see WORLD CROPS, 1959, 446). The exhibit also included two sizes of rotary scythes and the small 18-in. 'Hayterette'.

Howard 'Super' trench digger is based on the Fordson 'Major' tractor; where tracked machines must normally be moved from site to site on a special transporter this can travel under its own power

An interesting exhibit was the diesel version of the *Howard-Clifford* 'Rotavator 400', which was shown for the first time. It is powered by a 6.5-h.p. *Hirth* diesel engine; the petrol-driven model is powered by a 5.5-h.p. *JAP* engine. There was also a 2-wheeled tractor, the H.C.700, with a Hirth 6.5-h.p. engine, which can be fitted with a wide range of implements. Another new machine was the E.M.O. 40, produced to make the best use of the 'Selectatilth' system of interchangeable gears and primarily designed for use with tractors of low h.p.



Tractor fitted with Leeford 'Rotapeds', shown by F. A. Hughes & Co. Ltd., which enable the farmer to use pneumatics whenever the nature of the work calls for them

Another interesting machine, which we saw in operation at the *Ford* field day at Hamburg, was the Howard 'Super' trench digger, which is designed for attachment to the 4-wheel drive Fordson 'Super Major' tractor. On that occasion it gave a remarkable performance.

Landmaster Ltd., member of the *Firth Cleveland Group*, had the full range of their rotary tillers and cultivators on show, including two entirely new machines. Rotary tillers are now available with swing-foot blades, which allow cultivation under the gearbox of centre-drive models. The 'Landmaster 150' offered the alternative of 2-stroke or 4-stroke 4-h.p. engines and a flexible drive attachment is now available to allow the machine to be used as a power unit for the full range of chain saws, pruning saws, sander, polisher, grinder and drill offered by the *Tarpen Engineering Co.* There is also a new attachment—a 24-in. rotary grass cutter.

The 'Micron' tomato sprayer is a rotary atomiser which is powered by a 34-c.c. JAP engine and mounted on a monowheel carrier. This is the latest addition to the range of spraying machines which were shown by *Micron Sprayers Ltd.* and it is particularly being recommended for the spraying of cordon fruit, vines, bush fruits and outdoor tomatoes. The machine is designed to be drawn by the operator like a wheelbarrow and sends spray to both sides as it passes along the row. The 18-in. rotary disk atomiser is mounted on the shaft of engine and serves both as a flywheel and as a spray producer, giving uniform droplets approximately 80μ in size and having a throw of 9 ft.

High optimism was the keynote of the *Nuffield* stand. This company has announced a 25% increase in production during 1960, when 75% of their total production was exported to countries overseas. They have concentrated on the production of the Nuffield 'Universal Four', which has a pedal-operated differential lock to produce a rigid axle to counteract wheelspin on waterlogged land and

Reader Service

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Reader Service

WORLD CROPS,
Leonard Hill House,
Eden Street, London, N.W.1,
England

power steering, which, it is claimed, makes light work of driving under load over very rough ground. It has a normal p.t.-o. and also an independent p.t.-o. The latter makes it possible to stop the motion of power-driven implements during a turnabout at the headlands.

Pride of place was given by *Penney & Porter Ltd.* to their new oil-fired grain drier, described as Series II 75. It is claimed that this unit will dry grain at the rate of 6 tons per hour; the machine can also be used for bale drying by changing the direction of the hot air discharge to connect it with a 400-ft. platform on which the bale drying can be carried out.

This company has also developed a system of chain and flight conveyors and belt and bucket elevators to receive the wet grain, pass it through the new drier and pre-cleaner, and so on to the storage bins at a rate of 6-8 tons per hour. They were also showing their 'Winnograder' and various types of rotary adjustable screens for combine harvesters, together with sack barrows and sack lifters.

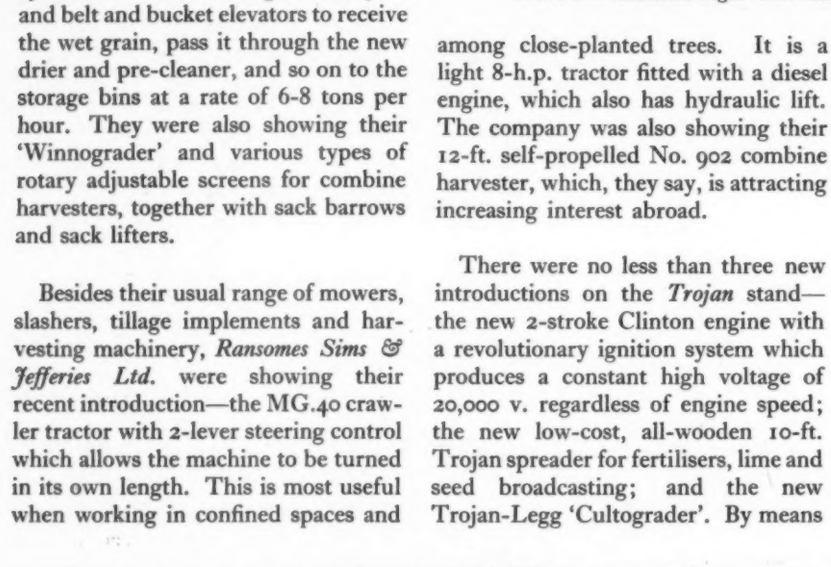
Besides their usual range of mowers, slashers, tillage implements and harvesting machinery, *Ransomes Sims & Jefferies Ltd.* were showing their recent introduction—the MG.40 crawler tractor with 2-lever steering control which allows the machine to be turned in its own length. This is most useful when working in confined spaces and among close-planted trees. It is a light 8-h.p. tractor fitted with a diesel engine, which also has hydraulic lift. The company was also showing their 12-ft. self-propelled No. 902 combine harvester, which, they say, is attracting increasing interest abroad.

The Peter Standen sugar-beet harvester seen at work in Lincolnshire

There were no less than three new introductions on the *Trojan* stand—the new 2-stroke Clinton engine with a revolutionary ignition system which produces a constant high voltage of 20,000 v. regardless of engine speed; the new low-cost, all-wooden 10-ft. Trojan spreader for fertilisers, lime and seed broadcasting; and the new Trojan-Legg 'Cultograder'. By means of a set of tines working in association with a grader blade, this last machine is able to do the work of a plough, cultivator, harrow and leveller. Thus in successive runs it can be used to open the soil, for subsoiling and for preparing a seedbed. It can also be used for soil-moving operations, excavating silage pits, reducing bunds, filling in ditches and cleaning out stock yards.

The 'Merry Tiller Professional' shown by *Wolseley Engineering Ltd.* was fitted with adjustable handles, which now allow three operating positions without the use of a spanner or tightening clamp. We noted, too, that its companion, the 'Merry Tiller Major', had a heavy-duty rear skid and a robust mounting for the engine and there was also a 16-in. roller seat for attachment behind a rotary grass mower or Webb lawn mower.

A new *Wright Rain* irrigation sprinkler — 'The Master' — was displayed for the first time. It is a medium - area, medium - pressure 2-nozzle sprinkler which would appear to be particularly suitable for the irrigation of permanent pasture and for tea, coffee, sugar-cane and similar crops where a high precipitation is acceptable because of the denseness of the crop cover, and where, of course, there is no danger of run-off. It weighs only 5 lb. Other sprinklers—the 'Monitor', 'Prefect', 'Master' and 'Major'—as well as manure rain equipment were also on view.



The 14 in. Wolseley saw bench is fully mobile and can be used with or without the truck. No bolts are needed to fit the saw to the Merry Tiller

Coming Events

Desert Locust Control.—The ninth session of the FAO Technical Advisory Committee on Desert Locust Control will meet in Rome from 16-30 January.

Farming and Country Planning.—A course of eight evening lectures has been arranged by the Department of Extra-Mural Studies, University of London and the Association of Agriculture on the subject of 'Farming and Country Planning'. The lectures will be given each Wednesday evening from 18 January to 8 March at 6.30 p.m. at the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1. The weekly series of lectures will cover the following subjects: The Ownership of Farm Land; Competition for the Land; Recent Changes in Rural Land Use; Changing Status of Town and Country; Effect of Planning on the Farmer; Transport and the Countryside; Green Belts and their Significance; The Farmer and the Community. The fee for the whole course is 15*s.* and for individual lectures 2*s.* 6*d.* Enquiries for further details and applications should be sent to: The General Secretary, The Association of Agriculture, 53 Victoria Street, London, S.W.1.

Horticulture.—The Chelsea Flower Show will be held at the Royal Hospital, London, from 16-19 March. Particulars may be obtained from the Royal Horticultural Society, Vincent Square, London, S.W.1.

An International Exhibition of Flowers and Plants is to be held in Turin from 28 April-7 May. Details may be obtained from the Fiori del Mondo a Torino, Esposizione Internazionale, Via Pomba 23, Turin, Italy.

Cocoa.—The FAO Cocoa Study Group is to hold its fourth session in Abidjan, Ivory Coast, during March.

Sugar.—An International Sugar Exhibition will be held in Amsterdam, Holland, from 10-19 April. Enquiries should be addressed to International Sugar Exhibition, Marnixstraat 380, Amsterdam.

Organisers of meetings, conferences and agricultural exhibitions are invited to supply information for this regular feature. This should be received by the Editor at least three months prior to the event.

Refrigeration and Air-Conditioning.—The International Refrigeration and Air-Conditioning Exhibition is to be held at Earls Court, London, from 11-14 April, 1961. Details may be obtained from Patrick Smyth, 1 Crane Court, Fleet Street, London, E.C.4.

Grain Storage.—A joint FAO and C.C.T.A. (Commission for Technical Co-operation in Africa) meeting on Grain Storage will be held in Accra, Ghana, during April.

Wheat and Barley.—The seventh FAO meeting on Wheat and Barley Improvement in the Near East will be held in Beirut, Syria, during May.

Grain.—The sixth session of the FAO Group on Grains will be held in Rome during May.

Plant Exploration and Introduction.—A Technical Meeting on Plant Exploration and Introduction will be held in Rome from 10-20 July.

Agricultural Exhibitions

Canada.—The Canada Farm and Industrial Equipment Trade Show will be held in Toronto from 25-28 January, 1961. Information from the Exhibition Organisers, 40 Wellesley Street E., Toronto 5.

The Ninth Salon of Agriculture will be held during February at the Palais du Commerce, Berri Street, Montreal. Enquiries should be addressed to the National Salon of Agriculture, 10819 St. Denis Street, Montreal.

Germany. — The annual 'Green Week' International Agricultural Exhibition will be held from 27 January-5 February. Enquiries should be addressed to Berliner Ausstellungen Eigenbetrieb von Berlin, Berlin Charlottenburg 9, Masurenallee 5-15.

Belgium.—The 41st International Agriculture and Agricultural Machinery Exhibition will be held in Brussels from 12-19 February. Details from Salon de l'Agriculture, 29 rue de Spa, Brussels.

Egypt.—The World Agricultural Exhibition to be held in Cairo will now take place from 21 March-20 April and not from 15 February-30 March, as previously announced. Details from the Exhibition Committee, Central Ministry of Agriculture, Cairo.

France.—The International Agricultural Machinery Exhibition will be held in Paris from 7-12 March. Particulars from the Salon International de la Machine Agricole, 95 rue Saint-Lazare, Paris 9e.

Italy.—The International Agricultural and Animal Farming Fair will be held in Verona from 12-20 March. Further details may be obtained from Secretary-General, International Agricultural Fair, Palazzo del Pallone, Verona.

South Africa.—The Rand Easter Show will be held from 21 March-3 April. Enquiries should be sent to the Witwatersrand Agricultural Society, P.O. Box 4344, Johannesburg.

S. Rhodesia.—A Central African Trade Fair and Exhibition will be held in Bulawayo from 3-14 May. Details from the Development Officer, Bulawayo Agricultural Society, P.O. Box 1776, Bulawayo.

England.—The Royal Show will be held in Cambridge from 5-8 July. Enquiries should be sent to the Secretary, Royal Agricultural Society of England, 35 Belgrave Square, London, S.W.1.

Agricultural Chemicals, Seeds and Supplies

A Lincolnshire farmer stands in a fine crop of Viking—a new hybrid winter wheat. Yields of over 50 cwt. per acre were said to be obtained and the new wheat stood up in an impressive way to severe storms

New Winter Wheat

A new hybrid wheat, to be known as Viking, has been produced in Denmark by crossing Hybride du Joncquois (one of the parents of Cappelle) and a single-plant selection from other French breeding materials.

This Viking wheat is claimed to yield more than any of the four main varieties grown in Britain, *viz.* Cappelle, Hybrid 46, Professeur and Flamingo, according to trials carried out by *Nickersons* and farmers in Norfolk, Suffolk, Yorkshire and Lincolnshire, who have obtained yields of 2 tons per acre and over. Other advantages claimed are that it has a shorter, stronger and stiffer straw than the principal varieties; it produces a usable straw, as it does not break up in the combine; it is as resistant to eyespot as Cappelle; it will hold its grain well and does not shed; and it is earlier than other varieties, so that it is possible to harvest it in more favourable weather conditions.

Cleaning Tanks and Drums

Conventional caustic cleaners do not always give the complete benefits of spray cleaning. 'Bruspra' No. 1 cleaner is a caustic product which has been specially developed by *Diversey (U.K.) Ltd.* for the spray cleaning of stainless steel and copper surfaces. Their No. 42 cleaner is non-caustic, but highly alkaline and designed for use on glass, porcelain, vitreous enamel and aluminium surfaces and they have special cleaners also for tanks or vessels with wax, resin, asphalt or phenolic linings. These products should find their applications in the rubber and vegetable oil industries and for the cleaning of vats and stills.

Seeds in 1-acre Packs

Cannells & Sons are now offering their kale and root seeds in prepackaged form. Seed for mangels and fodder-beet, natural kales, swedes, turnips etc., will be offered in multi-walled paper bags in packs containing sufficient for 1 acre, 2 acres or 5 acres and all seed will be treated against pests and diseases. Combinations of these acre packs can thus be bought for any required acreage.

Telvar and Karmex

These are the registered trade marks of two *Du Pont* weedkillers. The first is based on monuron—3-p-chlorophenyl-1,1-dimethyl urea—and the other on diuron—3-(3,4-dichlorophenyl)-1,1-dimethyl urea. These definitions were accidentally reversed in the list of weedkillers given on page 446 of the November issue of WORLD CROPS.

Silage Making

It is possible to make high-grade silage from grass, legumes, maize, oats and sorghum by using airtight and weatherproof covers, made of polyethylene film and adopting the methods developed at Purdue University. The loss by spoilage is thereby reduced to less than 5% and the product, so obtained, will be of the highest nutritive value, providing the green crop has been correctly harvested.

An illustrated booklet describing the process using sun-resistant black 'Visqueen' film has been produced by the *Union Carbide Corporation* of U.S.A. and may be obtained through our Reader Service.

Checking kale trials forming part of Cannell's extensive breeding programme involving many types of brassica

Correction

CORRESPONDENCE

The third paragraph in the letter from Mr. D. Boocock, of *Preservation Developments Ltd.*, in our November issue, p. 438, was printed incorrectly. It should have read:

'Brushing is the only method of applying the solvent-type preservatives, mentioned in the article, and as Dr. Findlay rightly points out, they may fail to give adequate protection if insufficient preservative is absorbed by the timber as a result of application by this method'.